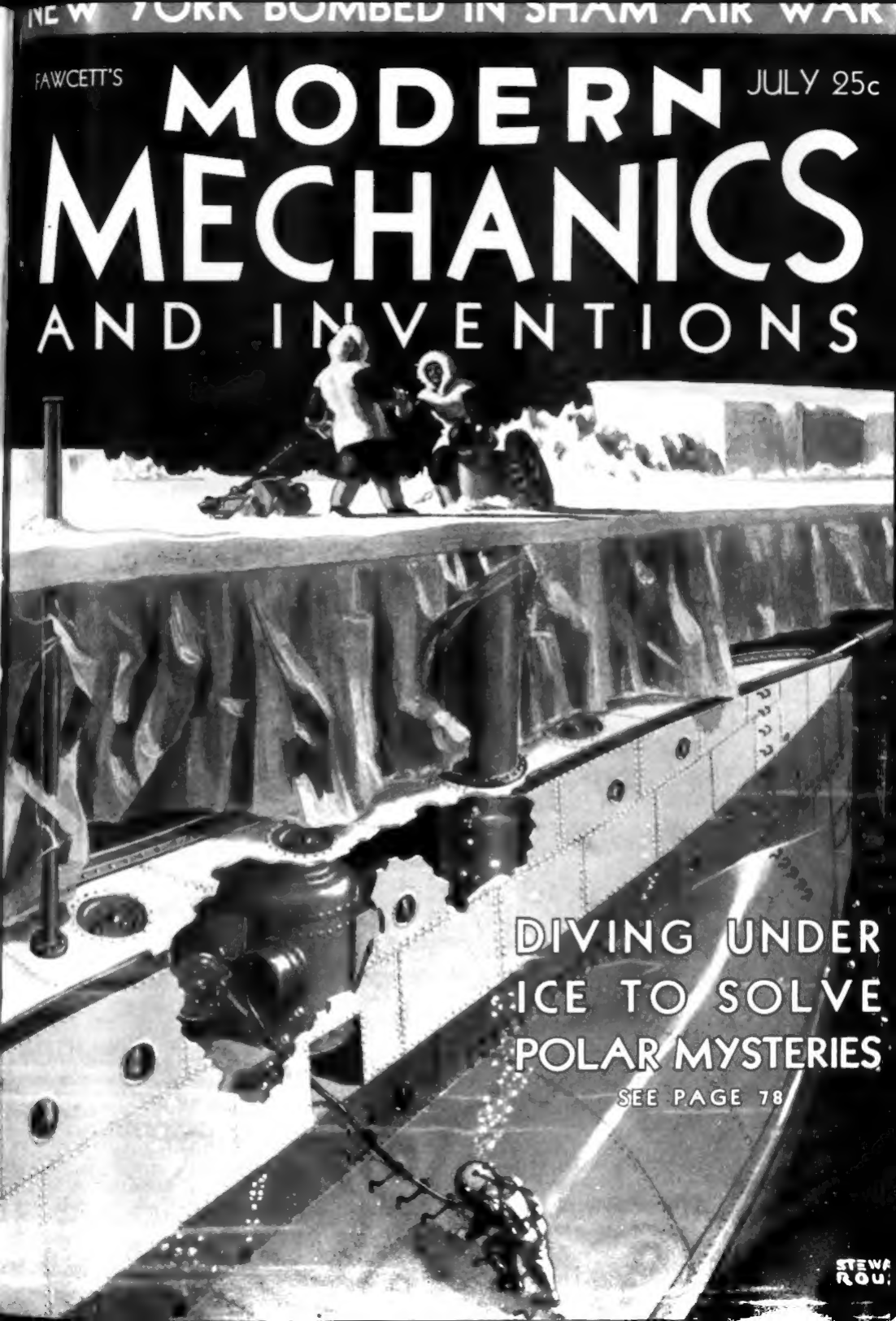
NEW YORK BOMBED IN SHAM AIR WAR

FAWCETT'S

MODERN MECHANICS AND INVENTIONS

JULY 25c



DIVING UNDER ICE TO SOLVE POLAR MYSTERIES

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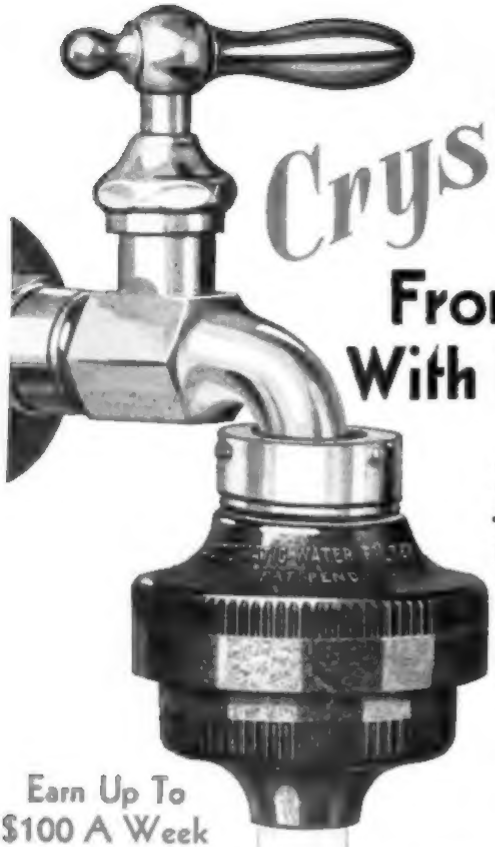
STEWA
ROU

Crystal Clear WATER From Your Faucet With New Invention



Filters Water-Removes Dirt

JUST imagine a device that filters drinking water instantly at the faucet. In just 10 minutes it removes enough dirt and filth to fill the bottom of a glass.

Attached to the faucet in an instant, it delivers sparkling clear water, which is clean as crystal, after filtering out dirt, filth and scum.

Clean Water Is Important

It's just like bringing a bubbling crystal spring right into your kitchen. The Automatic Water Filter works like Nature in passing water thru crystal silica sand. This delivers a sparkling clear stream of water, cleaned of suspended materials, pleasing to the taste, and healthier to the body. Crystal spring water could be no more clean or dirt-free than water coming out of the Automatic Filter.

Housewives everywhere want this Filter. They know its importance — they know dirty water is unhealthy. You wouldn't think of eating dirty food—then why drink dirty water?

The Automatic Filter is so inexpensive everyone can afford it! It saves buying expensive spring water. Pays for itself. You will never be without it, once you've used it in your home.

Earn Up To $100 A Week

We have arranged a plan that makes it possible for agents to start immediately, making big money. Good paying territory is still open. The agency for the Automatic Filter is a gold mine. Right in your territory there are thousands of prospects waiting for this new and inexpensive way to clean their drinking water. It is an absolute necessity for every faucet—everybody is a prospect. The Filter sells itself, with its quick demonstration.

Agents!

If you are earning less than $3.00 an hour, clip and mail the coupon today. Quick sales, big profits, and a product everyone has been looking for, gives you immediate success and a steady business. For interested workers we have arranged so their sample will cost them nothing. Mail coupon today for FREE OFFER PLAN.

GUARANTEE

It makes no difference where you live, or what kind of drinking water you have, we guarantee the Automatic Water Filter to remove dirt and filth, and deliver clean, crystal clear sparkling water, or the trial costs you nothing. Try the Automatic Water Filter in your own home at our risk, and prove it to yourself.

MAIL THIS COUPON TODAY

Automatic Water Filter Co.
1229-2621 N. 3rd St., Milwaukee, Wis.

Gentlemen: You may send me full particulars of your free offer and big money making proposition.

Name .....

Address .....

City .....

AUTOMATIC
WATER FILTER CO.

DEPT. 1229-2621 N. THIRD ST., MILWAUKEE, WIS.

THOUSANDS·

discover this new way

to quick mastery of

Correct English

and

Fluent Speech

In both business and social life the English you use can help you get ahead or hold you back.

●FREE TRIAL MEMBERSHIP

in the new 15-Minutes-of-English Club accepted by over 10,000 men and women. Offer may be withdrawn soon. Act at once to receive 5-Vol. Club Set free for five days' trial.

IF YOU are not absolutely sure of your English you are probably making mistakes that are costing you dearly. As the photographic scenes show, the English you use can help you get ahead or hold you back, in both business and social life.

Now you need no longer fear costly, embarrassing mistakes. Now you can acquire the poise and the self-confident bearing that are yours when you KNOW that you are using correct English. You are invited to accept free trial membership in the new 15-Minutes-of-English Club and win mastery of every phase of spoken and written English.

How Club Set Solves Your Problems

Membership in the 15-Minutes-of-English Club brings you this new mastery of speech and writing through the 5-Vol. Club Set shown below. This Club Set covers *all* your needs. One volume is devoted to English and corrects the mistakes you may now unconsciously make. Another checks your errors in Pronunciation. Still another gives you "power of words"—adds thousands of new words to your Vocabulary and helps you to express your thoughts clearly and most effectively. A fourth volume shows you how to prepare and answer Social Letters of all types, and gives over 100 actual letters for your use. A fifth volume shows you how to influence others through effective Speech-Making, preparing you for your big opportunity, when you are asked to get up and "say a few words," at a business conference, banquet, club and lodge meetings, debates, etc.

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It costs only a 2c stamp—to mail the coupon below—to receive the 5-Vol. Club Set free for five days' trial. Make this 2c investment. Then for five days go through each volume, test yourself, correct errors you may now unconsciously make, and "sample" the many unusual features.

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You have always wanted the certainty that you were speaking correctly, freedom from the embarrassment caused by mistakes in English, the ability to express yourself clearly and most effectively. Find out how the 15-Minutes-of-English Club plan can help you—accept free trial membership—mail the coupon and receive the 5-Vol. Club Set for five days' trial and examination. Send to:

G. P. PUTNAM'S SONS (Dept. 47), 2 West 45th Street, New York, N. Y.

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Gentlemen: I accept free trial membership in your new 15-Minutes-of-English Club. Send the 5-VOL. CLUB SET at once, all charges paid, for five days' free examination. If I wish to keep the books and the free book-box, at the end of five days I will send $2.00 and then $2.00 each month until $9.85 has been paid or I will send $9.00 at once in full payment. Otherwise I will return the books at your expense and owe nothing. There are no dues nor other payments except for the Club Set. Ship to

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MODERN MECHANICS AND INVENTIONS

PRICE 25 CENTS
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July, 1931

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National Salesmen's Training Asso.,
Dept. H-704, N. S. T. A. Bldg.,
Chicago, Ill.

Without cost or obligation you may send me your free book, "The Key to Master Salesmanship."

Name .....

Address .....

City ..... State.....

Age..... Occupation.....

They Laughed When I Mailed This Coupon

..But It Brought Me The Book That Showed Me How to Make $10,000 a Year!

As I walked up to the mail box, Joe nudged Ed and winked broadly for my benefit.

"Sh!" he hissed in a loud stage-whisper. "This is going to be the big turning point in Frank Parker's life! He's writing for a book that tells how to get into salesmanship. Pretty soon he'll be earning so much that he'll make the rest of us look like pikers!"

Ed snickered.

"Won't it be grand!" he grinned. "Now he can quit punching time-clocks and eating 40-cent lunches." He raised his voice. "Drop me a postal sometime when you get out into big business and start making $10,000 a year, will you, Frank?"

They both laughed uproariously. And probably it **did** seem like a joke to them that a $30 a week clerk would have the nerve to think he could ever get anywhere or make real money without some special "gift" or "pull."

But they laughed too soon. Just yesterday I sat down and wrote to Ed who is still at the shop, dragging along at the same old job.

"Dear Ed"—I wrote. "You asked me to send you a card when I 'got into big business and started making $10,000 a year.' Well, here's your card. Yesterday I was promoted to the job of assistant Sales Manager of the Western Metal Works, at a salary that goes with it. I'll loan you my copy of that book on salesmanship you used to think was such a joke."

Only a book! Just seven ounces of paper and printers' ink—but it contains one of the most vivid and inspiring messages that any ambitious man can read. It reveals the real truth about the art of selling, explains the science of selling in simple terms, and tells exactly how the great sales records of nationally-known star salesmen are achieved. And not only that—it outlines a simple plan that will enable almost any man to master scientific salesmanship without spending a moment on the road—without losing a day or a dollar from his present position.

A Few Weeks—Then Bigger Pay

Reason it out for yourself. Salesmanship offers bigger returns and delivers them quicker than any other line of work under the sun. But many people have subscribed to the foolish notion that a man has to be "born" with some sort of "gift" for salesmanship. Nothing could be farther from the truth. Just like any other profession, salesmanship is governed by certain fundamental rules and laws—laws which you can master as easily as you learned the alphabet.

Right now an unusual demand for salesmen is being reported. City and traveling sales positions are open in nearly every line all over the country. Last year requests for over 50,000 trained men were received. This employment service is free to both employers and employees, and thousands have secured excellent positions this way.

Free to Every Man

See for yourself why "The Key to Master Salesmanship" has been the deciding factor in the careers of so many men who are now making $10,000 a year. See how Mark Barichievich of San Francisco, Calif., for example, jumped from $8 a week as dishwasher to $150 as salesman. Find out how F. B. Englehardt of Chattanooga doubled his pay and commenced earning $7,000. Learn for yourself the REAL truth about the art of selling! If we were asking $2 or $3 a copy you might hesitate. But the book is now FREE. You do not risk one penny nor incur the slightest obligation. And since it may alter your entire future, it certainly is worth your time to fill out and clip the coupon at the top of this page. Why not do it now!

National Salesmen's Training Association

Dept. H-704

N.S.T.A. Bldg. Chicago, Ill.

Where Shall We Send Your Copy—FREE?

MAIL COUPON ABOVE TODAY

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I will show You too

how to start a spare time or full time

Radio Business of Your Own

without Capital

J. E. Smith, *Pres.*, National Radio Institute

The world-wide use of receiving sets for home entertainment and the lack of well trained men to sell, install and service them have opened many splendid chances for spare time and full time businesses. Besides Radio's growth is opening hundreds of fine jobs every year. "Rich Rewards in Radio" gives detailed information on these openings. It's FREE.

So many opportunities many make $5 to $30 a week extra while learning

Many of the ten million sets now in use are only 25% to 40% efficient. The day you enroll I will show you how to do ten jobs common in most every neighborhood that you can do in your spare time for extra money. I will show you the plans and ideas that are making as high as $200 to $1,000 for others while taking my course. G. W. Page, 107 Raleigh Apts., Nashville, Tenn., writes: "I made $935 in my spare time while taking your course."

Many $50, $60 and $75 a week jobs opening in Radio every year

Broadcasting stations use engineers, operators, station managers, and pay $1,800 to $5,000 a year. Radio manufacturers continually need testers, inspectors, foremen, engineers, service men, and buyers for jobs paying up to $15,000 a year. Shipping companies use hundreds of operators, give them world-wide travel at practically no expense and pay $85 to $200 a month. Radio dealers and jobbers are continually on the lookout for good service men, salesmen, buyers, managers, and pay $30 to $100 a week. Talking Movies pay as much as $75 to $200 a week to the right men with Radio training. My book tells you of other opportunities in Radio.

I will train you at home in your spare time

Hold your job until you're ready for another. Give me only part of your spare time. Hundreds have won success through my course. J. A. Vaughn jumped from $35 to $100 a week. E. E. Winborne seldom makes under $100 a week now. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men and young men for good jobs in the Radio industry by correspondence.

You must be satisfied

I will refund every penny of your money if you are not satisfied with my Lessons and Instruction Service when you complete. I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also train you in Talking Movies, give you home experiments in Television, cover thoroughly the latest features in sets such as A. C. and Screen Grid.

64-page Book gives the Facts

Clip and mail the coupon now for "Rich Rewards in Radio." It tells of the opportunities for a spare time or full time Radio business of your own; also of the many fine jobs for which my course trains you.

Get my new book **It points out what Radio Offers You**

J. E. SMITH, *Pres.*
Dept. 1-GH
National Radio Institute
Washington, D. C.

THIS COUPON IS GOOD FOR ONE *FREE* COPY OF MY NEW BOOK — mail it TODAY

J. E. Smith, *President*,
National Radio Institute, Dept. 1-GH
Washington, D. C.

Dear Mr. Smith:—Send me your book. I want to see what Radio offers. I understand this request does not obligate me and that no agent will call.

Name.....

Address.....

City.....*State*.....

Here are a few examples of the kind of money I train *"my boys"* to make

Started with $5, Now has Own Business

"Can't tell you the feeling of independence N.R.I. has given me. I started in Radio with $5, purchased a few necessary tools, circulated the business cards you gave me and business picked up to the point where my spare time earnings were my largest income. Now I am in business for myself. I have made a very profitable living in work that is play."

Howard Houston,
512 So. Sixth St., Laramie, Wyo.

Made $700 in 5 Months Spare Time

"Although I have had little time to devote to Radio, my spare time earnings for five months after graduation were approximately $700 on Radio sales, service and repairs. I owe this extra money to your help and interest. Thanks for the interest shown me during the time I studied and since graduation."

Charles W. Linsey,
537 Eliati St., Denver, Colo.

$7396 Business in two and one-half Months

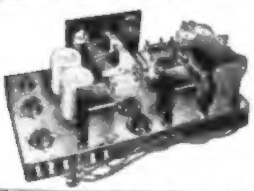
"I have opened an exclusive Radio sales and repair shop. My receipts for September were $2332.16—for October, $2887.77 and for the first half of November, $2176.32. My gross receipts for the two and one-half months I have been in business have been $7396.25. If I can net about 20% this will mean a profit of about $1500 to me."

John F. Kirk,
1514 No. Main St., Spencer, Iowa.

Rear view of 5-tube Screen Grid Tuned Radio frequency set—one of many circuits you can build

You'll get practical Radio Experience with my new 8 Outfits of Parts that I'll give you for a *Home Experimental Laboratory!*

My course is not all theory. You use the 8 Outfits I'll give you, in easily working out the principles, diagrams and circuits used in modern sets and taught in my lesson books. This 50-50 method of home training makes learning easy, fascinating, interesting. You get as much practical experience in a few months as the average fellow who hasn't had this training gets in two to four years in the field. You can build over 100 circuits with these parts. You experiment with and build the fundamental circuits used in such sets as Crosley, Atwater-Kent, Eveready, Majestic, Zenith, and many others sold today. You learn how these circuits work, why they work, how they should work, how to make them work.



Get the facts on my Lifetime Employment Service to all Graduates

ELECTRICITY Your Servant

—now the World's Biggest Employer!

General Electric Company

From the report of Gerard Swope, President, we find sales in 1930 over $376,000,000, only 9% below the biggest year in General Electric history. Net profits were $67,000,000 — ahead of all years except 1929. 78,000 people employed, salaries not reduced in 1930 from peak levels.

American Telephone and Telegraph Co.

President Gifford says "There was a net gain in 1930 in the number of telephones installed of 122,500. The total number of local phone conversations was 2% above 1929, and of long-distance calls 1% above 1929. The average investment in plant and other assets increased 14.5 per cent. Assets over 5 BILLION DOLLARS.

"For the employees there has been no reduction in wage rates, and the amount paid for wages in 1930 was the largest sum in the history of the system."

Paul Garrett, financial editor of the New York Evening Post, says "In 1930 employees of the A. T. & T. saved $70,000,000 (under company thrift plans), over 10% of their pay, where in 1929 they saved 8%."

Blazing lights—tell you about Electricity—*your servant.* A necessity in your home, your office, your factory. Now consider these facts about Electricity—as the world's biggest and best-paying *employer!*

[1] ELECTRICITY is practically the only major industry that continued to prosper and forge ahead during the depression of the past two years.

[2] ELECTRICITY is outstripping all other industries—employing more men, and will be the fastest growing industry during the next 25 years.

[3] ELECTRICITY is not one but virtually fifty industries all combined into one huge enterprise.

[4] ELECTRICITY has changed practically every mechanical line of work. Electricity has made possible — the aeroplane — the automobile — light — power — transportation — communication — electrical refrigeration—and what not. While electrical controls have electrified all mechanical processes.

[5] ELECTRICITY, while it has altered the work of thousands of men, offers a logical solution of the problems of every man who finds his old trade gone or changed to such a degree that regular employment is uncertain.

[6] ELECTRICITY will need thousands of additional men in the next few years.

Through the courtesy of one of America's greatest Electrical companies, we are able to offer you an illustrated booklet, "Looking into the Future of Electricity," presenting from the *Employer's* point of view the opportunities in Electricity. Men with personal problems, who are dissatisfied with their prospects and earnings, will find food for thought in this valuable free book. Mail the coupon.

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Occupation.....

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Andy's Shop Mail Box

What Ho, the Hangar Gang! Drop those monkey wrenches and gather around while Andy, the Duke of Bilgewater, wallows through this month's mail, as only the Double M trained grease monkey can wallow.

"The time has come," the Grease Monk said.
"To talk of many things—
Of planes and boats and airmobiles,
And mail the postman brings."
With a deep bow to Lewis Carroll

AND without further ado he plunged into the mail box, which by this time had grown to the size of a zeppelin hangar, and fished forth the following missive:

Richardson, N. D.

Dear Andy:

I am enclosing a snapshot of the aeromobile that Eugene Lantz and I have built. It is powered by a Model T motor which swings a five-foot prop. We have made speeds of 55 miles an hour and twelve miles on a gallon of gasoline. We built it in a month of spare time and we are both seventeen years of age. I wish you would publish this in your maga-

Yours sincerely,
EDWARD R. BRAULICK.

Edward R. Braulick and his aeromobile, which staggers over North Dakota roads at 55 m.p.h.

No sooner said than done, Ed Ol' Boy, Ol' Boy, OL' BOY. Keep your head out of the prop. Bobbed ears are positively out this year, although I must admit that they help when it comes to donning a helmet. But then, perhaps your ears don't interfere the way mine do. I'm really afraid to wiggle my ears in a slight breeze for fear I'll take off.

NOW, if the shock won't be too great, I'm going to get serious and attempt to express the feelings of myself, the editors, and ten thousand (always conservative!) light plane fans.

As you probably know, more and more states are passing laws requiring the licensing of all aircraft flying within their boundaries. Some step should be taken to halt this thoughtless and harmful legislation. The states passing these laws are being far more stringent than the Federal Government.

No one will deny that any citizen has as much right to build and fly an airplane as did the Wright Brothers, yet this right is being arbitrarily abridged by the passage of ill-advised air laws.

(Continued on page 16)

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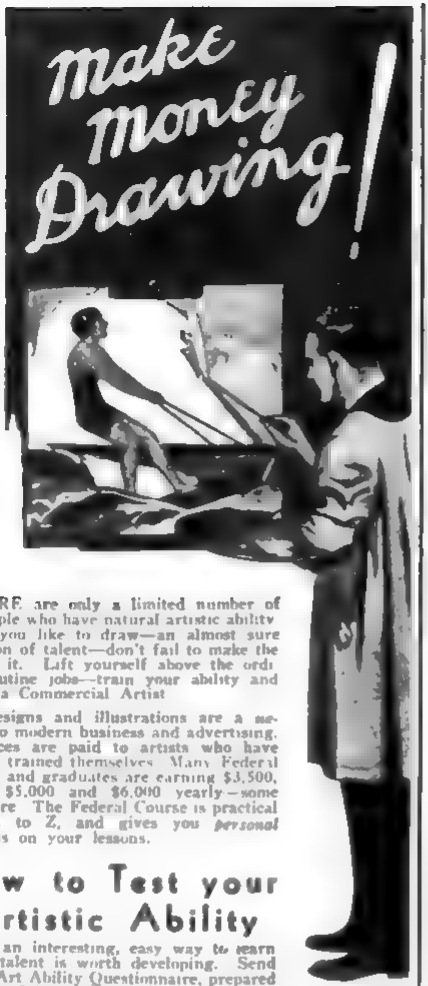

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ANDY'S SHOP MAIL BOX

(Continued from page 12)

In my opinion (just in case you're interested) the state has no authority to restrict the liberty or action of any citizen except to protect life and property. The necessity for such protection must be proved. In the case of airplanes, then, it must be established that any certain aircraft is not airworthy before it can be barred from use, as a public menace. The average aircraft inspector is not qualified to make such a declaration, as this requires an engineering education in aerodynamics.

The states are proceeding on the assumption that it is within their rights to declare all aircraft to be unairworthy except on presentation of satisfactory evidence to the contrary. But this evidence, as now demanded, must be in the form of an intricate, lengthy, and extremely costly stress analysis.

This requirement puts all hope of ever building and flying a plane far beyond the reach of the average amateur inventor, working a hardship on the advancement of the science of flying. Substituted for this stress analysis should be a series of laboratory tests, properly photographed and attested, which would establish the strength of the various members of the structure and would still be within the abilities, both financial and physical, of the average constructor. Drop and loading tests would accomplish this.

Federal Regulations Reasonable

A law requiring the licensing of all aircraft is unconstitutional unless some reasonable means of securing the required license is provided. The requirements for licensing an airplane are not now reasonable, inasmuch as they are beyond the scope of otherwise capable mechanics, and tend to discriminatory and to oppress private enterprise.

The U. S. Department of Commerce recognizes the right of a citizen to fly any airplane, and in its regulations provides that such aircraft as are not being used as public conveyances nor for commercial purposes may be legally flown. Identification numbers of unlicensed aircraft are issued upon request. Some individual states, however, have neglected this provision to the great detriment of private plane owners and to the impediment of experimentors.

I doubt if the state laws which now exist would stand in the event they were brought

(Continued on page 20)

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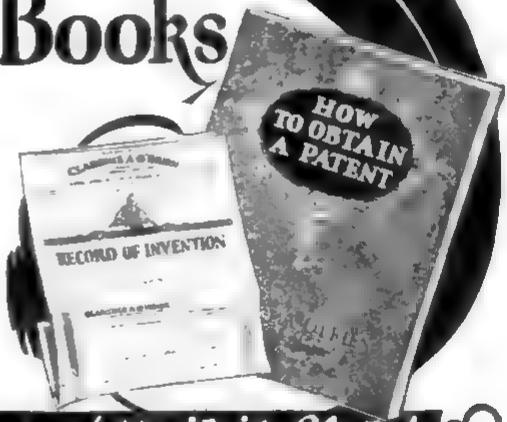

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If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

ANDY'S SHOP MAIL BOX

(Continued from page 16)

before the courts and properly prosecuted by a competent attorney. I know that mergers and monopolies are in favor just now, but I do not believe that the laws of our states should be so framed that they automatically place and concentrate the production of any commodity in the hands of a few favored manufacturers.

JUST to show you the kind of fellows the laws of some states tend to discourage, take a look at the picture below and then read the letter which follows. If it's right to stifle the ingenuity of such lads as this, it would have been proper to forbid the Wright Brothers and Glenn Curtiss to experiment with airplanes.

This is the second of the home-designed and built airplanes by C. R. Lansing of Warren, Ohio. His next job, he says, will be the Pietenpol Camper.

Warren, Ohio.

Dear Andy:

I have built two planes using Henderson motors. The first one I built almost entirely of 24 ga. ¾" steel tubing, all joints being brazed. I used one of the old motors and the plane was heavy (380 lbs.), but with a little head wind I have had it about fifty feet.

I never took any flying lessons, and the plane got some pretty bad bumps before I learned to set it down easy, but although the tubing gave way sometimes when the wind quit on me and dropped me twenty or thirty feet, not one joint ever failed.

On the second plane I used a Henderson De Luxe motor. The ship was designed lighter and stronger and seems to fly good. I've had it up over 100 feet, but am afraid to get it away from the airport because the motor gets hot and starts missing. I am putting an air scoop on it now and a supercharger made from a vacuum sweeper fan and housing. If it is a success I will write and tell you how I made it.

Please send me blueprints of the Pietenpol Camper, as I want to have something this summer that I know will fly. I would like to hear from any one near Warren contemplating building the Air Camper if they want a

(Continued on page 22)

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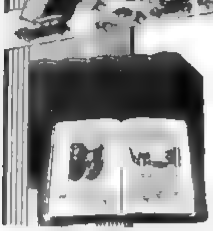

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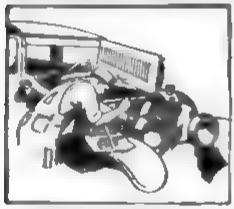

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ANDY'S SHOP MAIL BOX

(Continued from page 20)

welded steel fuselage, as I have been welding for fifteen years and have built several welded steel fuselages.

Yours respectfully,
C. R. LANSING.

I hope some of my critics notice that people are becoming respectful to me. Maybe if people begin to take me seriously I will get a raise, but then I suppose I'll miss most of the fun I get by being the village cut-up.

Meet John Edwin Hogg

Lieutenant-Commander John Edwin Hogg, U. S. Naval Reserve, who is a regular contributor to Double M. See his Gold Rush story on page 70.

THE subject of the above photo is not Admiral Richard Byrd, for whom he is frequently mistaken (much to his embarrassment). He's none other than John Edwin Hogg, and he lives at Alhambra, California, when he's not traveling hither and yon in search for another good yarn for Double M.

And does he travel? You should ask! Just read this excerpt from a recent letter:

"—In 1927 my wife and I went into the very geographical center of the previously unexplored jungle of Dutch Borneo. When

(Continued on page 24)

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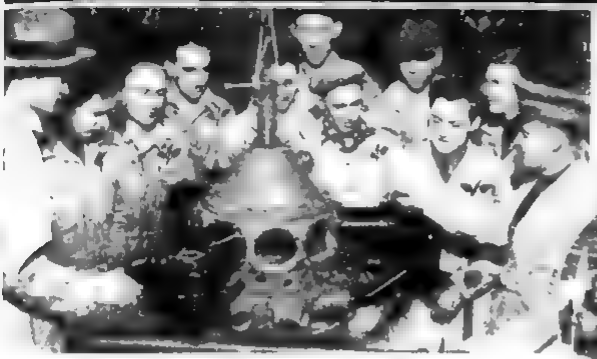
Announces a NEW COURSE!



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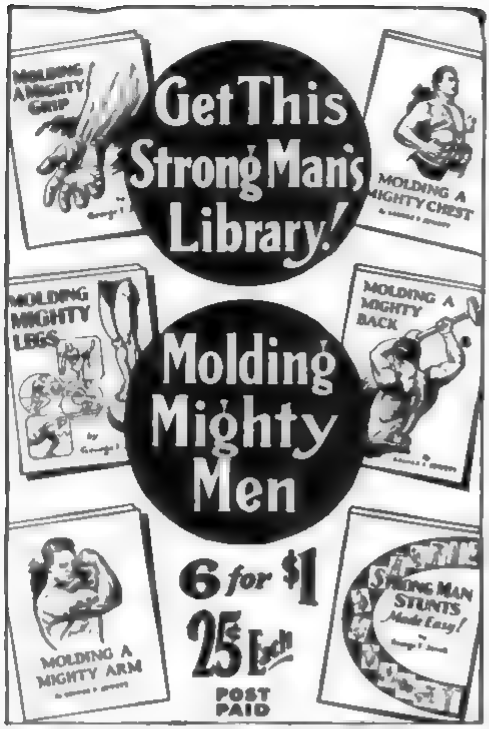

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ANDY'S SHOP MAIL BOX

(Continued from page 22)

we went in there the Dutch Governor-General at Buitensorg, Java, told us we could not possibly undertake such an expedition and expect to come out alive. Nevertheless we spent three months among the head-hunting Dyaks and Poonaaboons of the upper Barito River valley, where Mrs. H. was the first white woman ever seen by many of the natives. We not only kept on friendly terms with the natives, but came out without ever being sick a single day.

The life of an editorial free lance may not be the most profitable business in the world—but, it surely is interesting."

I wish I could find room to print more of his letters, for they're as interesting as his articles, but with little space and lots of material crying for a break, we'll have to turn to other matters. But first I want to recommend that you read Mr. Hogg's gold rush story in this issue. If I turn up missing one of these months, you'll know that I've given up a wicked life as column conductor and have become a gold panner.

Hangar Notes

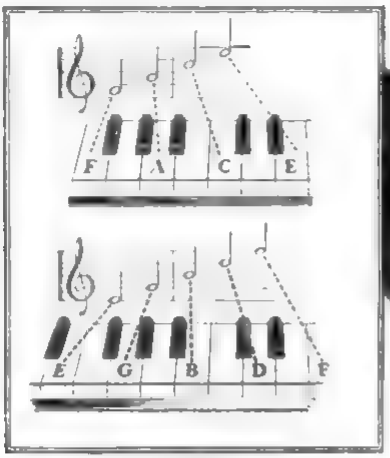
The latest Heath creation is a center-wing job. The new Heath fuselage is so designed that the wing may be placed at the top longeron, lower longeron, or above in the good old parasol fashion so familiar to readers of this here colyum.

ALL THOSE who have purchased Georgias Special blueprints are invited to write to the original designer of this crate, who promises to furnish you with the dope on the latest improvements. Just drop a line to Vernon W. Georgia, 639 Plymouth Bldg., Minneapolis, Minn., and he'll do the rest.

AND WHILE ON THE SUBJECT of blueprints, the editors wish me to announce the opening of the blueprint department to be conducted by this magazine. You already know about the Pietenpol prints which sell for $7.50. We can also furnish large size prints of the "Gannet", that nifty Ford powered cabin cruiser which appeared in the

(Continued on page 26)

HERE IT IS....



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Forget the old fashioned idea that you have to have "talent" or "musical ability." You don't at all, *now!* More than 600,000 people who could not read one note from another, are now popular and accomplished players, thanks to the U. S. School of Music.

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If you are tired of always sitting on the outer rim of a party, of being a professional looker on,—if you've often been jealous because others could entertain friends and were always in demand—if you've wanted to play but never thought you had the time or money to learn, let the time tested and proven U. S. School come to your rescue.

Don't miss any more good times! Learn to play your favorite instrument and be the center of attraction wherever you go. Musicians are invited everywhere, they are always in demand. Enjoy this greater new popularity you have been missing. Have the good times that pass you by. You can have them — easily!

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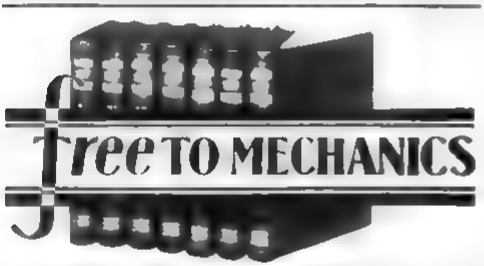

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ANDY'S SHOP MAIL BOX

(Continued from page 24)

March and April issues, for $2.00 a set, and prints of the "Punkin Seed", the outboard racing hydroplane which appears in this number, for 75c. Watch this column for further announcements.

DON'T BE LIKE THE FELLOW who wrote us a burning letter, in which he loudly squawked because the Pietenpol blueprints were not the full size of the ship. I suppose if he were getting plans of the Empire State Building he would want them the full size of that edifice. And then where would he put them? Full size means the size of the original drawings, and not the full size of the thing to be built.

L. H. SLEMMER, the winner of one of our recent flying contests, has the additional honor of being the first to complete the Pietenpol Camper from plans which he bought from us. He says in part, "I have no adjustments to make whatever as she flies with hands off. You can tell the world she's a fine flier!"

JOHN MAGRUDER, of 358 Heidleman Road, Los Angeles, Calif., says he is building a Diesel engine of his own invention, and that he is equipped for aircraft welding and engine building and would be glad to assist any one in the Los Angeles territory in building a plane or converting an engine.

R. ANDREWS, Tilbury St., Tilbury, Ontario, wants to hear from a few amateur light plane fans who are building or have built the Baby Bullet Raceplane.

FREDERICK SEILER has just accepted the position as Production Director with the Heath Aircraft Company. Mr. Seiler designed and supervised construction of the 209-lb. Kreider Midget monoplane which won the Scientific American Trophy at the 1926 National Air Races, defeating all ships up to and including 300 cubic inch displacement. The midget had a displacement of only 80 cubic inches.

Rohrbach Reactions

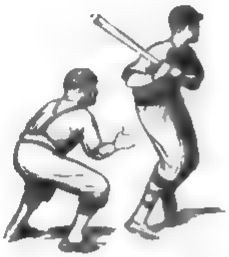
HANS ROHRBACH's recent article brings this comment from Thomas B. McDowell, of Twin Falls, Idaho:

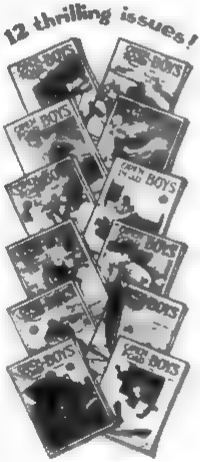
I read with considerable interest Hans Rohrbach's article concerning his reaction engine.

(Continued on page 28)

We'll GIVE you this BASEBALL

Special Friendship Offer!





IT'S a regular wow! A sure enough big time ball which we give to every one who answers this advertisement. The City League is a lively ball, regulation size and weight, 5 oz. and 9 in. Has a solid rubber center, with a highly compressed felt and rubber core, tightly wound with fine quality yarn. Finish winding is of Sea Island cotton. Genuine alum tanned horsehide cover, hand sewn with extra strong red and blue thread. A ball that keeps its solidity, retains its shape and stands up a long time under hard service. Made by The Draper-Maynard Company, makers of quality sporting goods for generations. Clip the coupon, fill in your name and address, pin $1.00 to it, and mail it TODAY! Your ball will be sent immediately postpaid, and you will also receive The Open Road for Boys for one year.

THE OPEN ROAD FOR BOYS has 50 pages or more every month crammed with stories of aviation, sports, school, business and ranch life, high adventure on land and sea, mystery and daring. Great book-length serial stories, interesting articles, jokes and humor, International Correspondence Club, stamp department, and THE OPEN ROAD PIONEERS—nation wide club for boys. Contests galore for all. Not a page is wasted, each one filled with action, mystery, thrills.

Big Leaguer
130 Newbury St.,
Boston, Mass.

This offer good only in the United States.

Here's My Dollar. Rush regulation baseball at once, Postpaid, and send me Open Road for Boys for a whole year.

Name

Street

City State

RUDOLPH L. DUNCAN, President, RCA Institutes, Inc.; Member, Institute of Radio Engineers; Member, Radio Club of America; Member, Veteran Wireless Operators' Association; Captain, SCR, United States Army.

A Radio message

To men who are looking ahead!

***by* R. L. DUNCAN**

ONLY a few men will read this message . . . but they will be the type of men in whom I am personally interested. For such men . . . I want to open the door to thorough training in radio. And the coupon below is the first step!

Naturally, we want our message to reach as many men as possible. So we founded resident schools in four metropolitan cities. Then we opened our courses to men all over the world who cannot afford to give up their positions. Thousands of our students study at home in their spare time. With the equipment we furnish, they have their own radio laboratory right at home! You, too, can start your course at home *any time!*

Our courses cover the entire radio field. We train beginners who have had no previous knowledge of radio. Advanced students take our more technical courses. But whatever branch of radio interests you . . . is all ready for you to study. The cost is surprisingly low for the training you get.

As the oldest radio school in America, we have given training to nearly 20,000 men. Many of these are now executives and engineers in the largest broadcasting and manufacturing companies. But none of these arrived overnight. Nor will you. Your success depends on how well you train yourself . . . how hard you work. But we will help you. I personally invite you to write to me for our free book that gives you the complete story.

RCA INSTITUTES, Inc.

RCA INSTITUTES, Inc.
Dept. MC-7
75 Varick St., New York, N. Y.

Gentlemen: Please send me your FREE book which tells about your laboratory method of radio instruction at home.

Name .....
Address .....
.....
Occupation .....

ANDY'S SHOP MAIL BOX

(Continued from page 26)

Time and again some inventor comes forward and claims he has got an engine which will give 2-3-4 or 5 times the efficiency of the best engine of standard type, but they never hold up under actual test and of course are never taken seriously by learned scientists or technical experts but may be quite misleading to the average layman.

There are several reasons why the piston head doesn't get as hot as the cylinder head. Most pistons nowadays are made of aluminum which conducts heat away rapidly—all pistons are made hollow and thus have a large surface which is not exposed to the hot gases and serves as a cooling flange to the head of the piston which is exposed to the hot gases—It is true that the motion of the piston helps to keep it cool but not altogether in the way that Mr. Rohrbach would make us believe.

The inner surface of all single acting pistons is exposed to the air and as this air is kept in motion by the movement of the piston it quickly absorbs the heat from the piston. All double acting pistons such as used in Diesel engines have to be water-cooled the same as any other part of cylinder. Contrary to popular notion the movement of a piston is rather slow, thus a piston with a six-inch stroke and 5,000 R.P.M., "which is far above the average" doesn't make hardly 60 miles per hour.

Compare this with the velocity of the gases which average four or five thousand feet per second, or about three thousand miles per hour, which is too much difference to cool the piston much.

If the motion of the piston relative to the gases is responsible for its coolness why hasn't the gas turbine proven a success. The blades of a turbine travel at a much greater velocity than the piston of the highest speed reciprocating engine yet the heating of the blades is the main reason why they are not successful because there is no way of cooling them.

If anybody can invent an engine which will give twice the efficiency and somewhere near the same mechanical efficiency as the standard type of engine he will have no trouble in disposing of his invention to the aircraft industry, where payload and not the price of gasoline is the most important question.

It takes roughly 1,000 gal. of gasoline to fly the average plane from New York to London. If this could be cut into and the extra 500 gal. displaced with cargo, trans-Atlantic flying would become a common and profitable business.

Yours very truly,
THOS. B. McDOWELL.

Now listen to what Jay Earle Miller has to say in rebuttal:

(Continued on page 32)

Keeps Wrinkles Out of Soft Collars

and makes FORTUNES for Agents!

Amazing New Invisible Device Brings Representatives Up to $100 Weekly (Actual Figures)—Sells Itself in 3 Seconds—Men Go Wild About It!

Good-bye sloppy, wrinkled soft collars with turned-up ends! Now, through the invention of an invisible device which is inserted in a second, soft collars are made to lie smooth, flat, and even, without the slightest wrinkle. This remarkable device is called the **CREST COLLAR LAYRITE!**

It gives you soft collar comfort with starched collar appearance! It prevents soft collars from wilting under any conditions. It lengthens the life of shirts and collars. It makes any soft collar always trim, neat and attractive. Guaranteed to last a lifetime. 24K. Gold plated. Men grab the COLLAR LAYRITE at sight—and would not be without it at any cost.

1. Crest Collar Layrite slips under any soft collar and in a second!

2. Straightens [illegible] at instantly—Removes wrinkles. Holds points down. Gives collar neat starched appearance.

3. Here's the way this amazing device looks under the collar. But it cannot be seen!

Men—Here's the PROOF!

Representatives who handle Crest **COLLAR LAYRITE** are going like wild-fire. Here's how they are ordering:

"Ship 500 every week until further notice. Never saw anything like this."
J. Cole, Florida.

"I am using 300 a week. Expect to increase it soon."
A. Handler, Illinois.

"Through your special demonstration plan, I am disposing of from 500 to 1000 a week!"
M. Kripnik, Illinois.

"Going at the rate of 250 a week! Wonderful."
M. Strohle, Blue Island

200% to 600% Profits For You

Representatives are wanted merely to introduce **COLLAR LAYRITE**. No selling needed. Sells itself like hot-cakes—and pays you tremendous profits—from 200% to 600%. Our records show men are earning $75 - $90 - $100 weekly with **COLLAR LAYRITE**—and more.

Mail Coupon Today!

Just send 25c for Gold-plated sample of **COLLAR LAYRITE** and full details of our unusual money-making proposition. You have never seen anything like this before. Fill out coupon and mail with 25c TODAY!

CREST SPECIALTY CO.
227 W. Van Buren St., Dept. 72
Chicago, Illinois

Crest Specialty Co., 227 W. Van Buren St., Dept. 72, Chicago, Illinois.
I enclose 25c. Please send me one sample gold plated **COLLAR LAYRITE** and full details of your money-making plan.

Name ..

Address ..

Classified Advertisements

MONEY-MAKING OPPORTUNITIES IN TABLOID FORM

Rates for classified ads, 15 cents per word per insertion, or 12 cents per word per insertion for six insertions. Minimum 10 words. Cash should accompany order. Closing date 20th of third month preceding date of issue. Address Classified Manager, Modern Mechanics and Inventions Magazine, 35 East Wacker Drive, Chicago, Ill.

AVIATION

METAL Tipped Propellers for Henderson and V Motors $9.95 each. For 1 and Chevrolet Propellers $12.50 each. Hibbs, Fort Worth, Texas

BIGGEST, Best Catalog Model Airplanes, Parts, Supplies, Sensational Ideal Company, 19 West 18th Street New York

CHEAPEST, Best Supplies. Catalog Dime. Advanced Model Airplane, Peru, Indiana

NEW SB Henderson Aircraft motors equipped with propeller hub and SB cowling only $225.00. SB remanufactured Henderson only $175.00 complete with hub. All motors guaranteed. SB conversion group attached to your Henderson, Indian Four or Ace for only $35.00. Send dime or equal in stamps for catalog to The Sensenich Brothers, Lititz, Pa.

PIETENPOL Monoplane fuselage $50. Ribs $18.00. Old parts taken in trade. Pietenpol list and catalog 10c. Kamm Aircraft Co., 524-12th St., Oshkosh, Wis

SB PROPELLERS give good performance. Special Henderson propeller $16. New Hardwood for Ford model A, Szekley SR3, Continental A40 $35 each. Prices on propellers for other light engines upon application. Address, The Sensenich Brothers, Lititz, Pa.

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FORD A conversion parts. Send dime for catalogue Marsh & Cendt, Colby, Wisconsin

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AGENTS' Gold Sign Letters for store windows. 500% profit. Free sample. Metallic Letter Co., 426 N. Clark, Chicago

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BIG MONEY and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 11, East Orange, N. J.

CALIFORNIA Perfumed Beads, sell on, like Hot Cakes. Agents coining money. Catalog free. Mission Factory K, 2328W Pico, Los Angeles, Calif.

MANUFACTURER wants distributor for new "Pocket Radio", only $3.85. "Sells itself with music". Pays 100% profit. Spencer Radio, Dept. 23, Akron, Ohio

AGENTS for Hemstick, Original Powdered Handsoap. Approved Good Housekeeping. Everybody customer. Fine opportunity for hustler. Sample Free. Solar Products, P-2144 So. Troy, Chicago

MAKE Your Own Products. Employ Agents Yourself. Toilet articles, soaps, extracts. We furnish everything. Valuable book Free. National Scientific Laboratories, 1964W Broad, Richmond, Va

TABLECLOTHS and other Novelties Samples free. Dependable Rubber Products Co., 716 Madison, Chicago

GREAT success making your own products! Have others selling them. Start this fastest Big Money Business. My "Eye-Opening" literature tells how and lists Formulas, Processes, Trade-secrets of Best Selling Specialties - all kinds, all lines. Investment small, profits immense. Start anywhere. Miller, Chemist, 1706 B Miller Chemical Building, Tampa, Florida.

NEW Rubber Goods Line. 37 Money Makers. Rubber Rug, Cushions, Bath Mats, Raincoats, Rubber Soles, Aprons, Baby Goods, etc. Big Profits. Best Values. Direct from Akron, the Rubber City. Make up to $90 weekly. Credit given. Write for Catalog and Free Outfit Offer. Kristee Mfg. Co., 1457 Bar St., Akron, Ohio.

INVENTOR discovers "Electrical Wizard", saves motorist up to $100 yearly. One minute installation without tools. Pays for self first week. Write for details. Reardon Mfg., Dept. MM, Peoria, Illinois.

NEW radium invention opens tremendous home market. Free advertising, exclusive distribution. Wonderful opportunity for responsible man. Radiumized Applicator Co., 640 High, Buffalo, N. Y.

BIG Money Applying Gold Initials on Automobiles. Easiest thing today. No experience needed. $1.45 profit every $1.50 job. Free Samples. "Raleo" B 1045 Washington, Boston, Mass.

BIG MONEY Selling Shirts, Ties, Underwear, Sox, Raincoats, Coveralls, Pants, Playsuits. Outfit Free! Experience unnecessary. Nimrod Co., Dept. 132, 4922-28 Lincoln Ave., Chicago.

SELL Changeable Signs to Stores, Six Lines, costs 30c, sells $1.50. Particulars Free. National Sign System, St Louis, Mo.

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WRITE any sales letter or advertisement, one dollar. Advertising specialist; national experience. Komaroo, 532 Pine, Long Beach, Calif

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MAKE your Bows and Arrows. We sell material. Send 25c for working instructions and catalogue. Sidney Archery Works, Sidney, Ohio

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"EXCELLOGRAPH" Portable Rotary Stencil Printing Duplicators $39.00. Equipped. Terms, description, testimonials, printed samples, Free. Pittsburgh Typewriter Supply Co., Dept. 840 Pittsburgh, Pa.

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Classified Advertisements

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OZARKS—20 acres, timbered, poultry, fruit, berry land. Hunting, fishing. $100.00, $5.00 monthly. Hubbard, 227 Grossman Bldg., Kansas City, Kans.

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FOR INVENTOR'S Universal Educator: contains 900 mechanical movements; 50 Perpetual Motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price $1.00 postpaid in U.S.A. Address Dieterich Co., 602A, Ouray Building, Washington, D. C.

INVENTORS — Sell your inventions before patenting. Free particulars. Write W. T. Greene, 942 Barrister Bldg., Washington, D. C.

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FOR SALE—Patent: Automatic Transmission Lock, issued Oct. 14, 1930. Homer C. Kennedy, 4112 Enright Av., St. Louis, Mo.

IRWIN METEOR plane complete with SB Henderson motor and new propeller, price $375.00. Send stamp with inquiry to Sensenich Bros., Lititz, Pa.

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DON'T Be Unemployed. Become expert armature winder and electric motor repairman, start your own business, in your basement or garage, regulate your wages and working conditions. We instruct you the right way with simple instructions and practical charts. Everything explained in plain non-technical terms you understand. Write for free information today. Randle Bros. Armature Shop. 520 Fourth St., Waukegan, Ill.

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FOUR Big Magic Catalogs and Seven Mystifying Optical Delusions postpaid 15c. Gilmagico, Morgan Park, Chicago.

MONEY IN Magic—Beautiful catalog, 10c; stage money, 50 bills, 20c. Oaks Magical Co., Dept. 200, Oshkosh, Wis.

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GO INTO BUSINESS — Make Big Money. We start you furnishing everything. Experience unnecessary. Federal Pure Food Co., G2307 Archer, Chicago.

FIREMEN, Brakemen, Baggagemen, colored Train or Sleeping Car Porters, $150 $250 monthly. Experience not necessary. 311 Railway Instruction Bureau, East St. Louis, Ill.

MODEL GLIDERS

FREE! Parts 7" Balsa Model Glider if you pay packing and postage charges 5c coin. Azure Co., 929 Cottage Place, Union City, N. J.

MALE, FEMALE—HELP WANTED

WANTED, Eligible Men-Women, 18-50, quality for steady government positions, $105 $250 month; Paid vacations. Thousands appointed yearly, common education. Write, Instruction Bureau, 234, St. Louis, Mo., quickly.

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MOTORCYCLES, $25 to $100, easy terms. Side car, $25; engines for airplanes, motorcycles, boats and sleds, $15 to $100. Airplane wheels, $3; airplane wheels $1. New Firestone tires, $5; frames, $3; forks, $3; wheels, $1; chains, $2. New 30x3½ automobile tires, $2. Belts, magnetos, generators, tanks, cylinders, pistons, handle bars, saddles, parts. New low prices. Save dollars. Rebuilt bicycles, $9.50. Send 50c for catalog. Price Cutter Deninger, Rochester, N. Y.

SEND 15c today for latest illustrated used motorcycle catalog. Large stock Real bargains. Indian Motorcycle Sales, Dept. MM., Kansas City, Mo.

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BE SURE that the motor you purchase for your light plane will fly it. Heath B-4 and Heath Henderson motors are guaranteed to fly and 7 years of constant performance prove it. For economy and reliability these motors cannot be equaled. Send 10c for large illustrated booklet. Heath Aircraft Corp., Dept. KM 7, 1727 Sedgwick Street, Chicago.

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QUIT Tobacco Easy. Harmless home treatment. The NI KO System, Ojai, California.

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$5 to $500 EACH paid for Old Coins. Many very valuable. Get posted. Send 10 cents for illustrated Coin Value Book, 4x6. Guaranteed Buying and Selling Prices. COIN EXCHANGE, Box 81, LeRoy, N. Y.

OLD MONEY wanted. $5.00 to $2500 each paid for old coins. Buying catalogue 10c. Meyer Cohen, Box 483, Muskogee, Okla.

SPECIAL PRICES on United States old coins. Half cent 32c; Large Cent 10c; Eagle Cent 9c; White Cent 5c; Trade Dollars $1.15; Bargain Price List and old coin 10c. Emarcie, Box 483, Muskogee, Oklahoma.

PATENTS

INVENTIONS commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 582 Enright, St. Louis, Mo.

INVENTIONS and patents sold Outright or royalty. Free examination. Leading firm in country. H. G. Green Company, 180 West Washington St., Chicago.

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PATENTED Inventions Wanted. Will buy or commercialize. Write, N. Tutty, 1103 Bell Telephone Bldg., St. Louis, Missouri.

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5000 TINTED Enamel Folders, $13.75; 5000 Colored Envelope Slips, $5.00, 5000 6x9 Circulars $7.50. All printing low prices. Samples. Goodprint, Harrisonburg, Va.

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CRYSTAL Radio Fans; Melomite Crystal improves reception, price 25c, postpaid. Melomite Crystal Radio, $1.00. Complete, phone, aerial, $2.95. Music Sales, Dept. B A, Independence, Mo.

RARE PRINTS

NEW unique amazing pictures, taken recently during Chinese revolutions. 6 for 50c China Pictures, 90 Dales Ave., Jersey City, N. J.

SALESMEN WANTED

WANTED County Salesman with car, to demonstrate for large Ohio Manufacturer. First class job. Fyr Fyter Co., 2183 Fyr Fyter Building, Dayton, Ohio.

STAMPS

STAMPS! 100 diff. 2c; 500 diff. 24c; 1000 diff. 75c. Tatham Stampco, D9, West Springfield, Mass.

FREE! 100 Different, 2c postage. Scotty's 101 Bertha, Donora, Pa.

STORIES WANTED

HAVE YOU a story for the Talkies? Accepted any form. Criticism, development, revision, copyright, marketing. Write now for free booklet without obligation. *How to Write for the Talkies.* Daniel O'Malley Co. Inc., Suite 4, 1776 Broadway, New York.

SONG WRITERS

SONGWRITERS—"Real" proposition. Hibbeler, D195X, 2104 Keystone, Chicago.

SONGWRITERS — Read "Requirements of Talking Pictures, Radio, and Records" an explanatory instructive book SENT FREE to aspiring writers of words for songs. We compose, arrange music and secure copyrights. Write today. E. C. Newcomer Associates, 1674 Broadway, New York.

SONGWRITERS, poems, melodies. Mthe, MM 4215 North Ave., Chicago.

COMPOSERS—Verse or Music. Brilliant opportunity. Write VanBuren, 2485 McClurg Bldg., Chicago.

WIRELESS

LEARN Wireless (Radio) and Morse telegraphy. School, oldest and largest; endorsed by Telegraph, Radio, Railway and Government officials. Expenses low can earn part. Catalog free Dodge's Institute, Clark St., Valparaiso, Ind.

WELDING

LEARN Pipeline welding, America's newest industry, thousands of welders needed this year at $77 weekly. Free catalog. National Welding School, 580 Fort , Kansas City, Kansas.

ANDY'S SHOP MAIL BOX—CONTINUED FROM PAGE 28

Dear Mr. McDowell:

As I translated the Hans Rohrbach articles and prepared them for publication your letter questioning his claims of efficiency for his reaction engine, described in the May issue, has been referred to me.

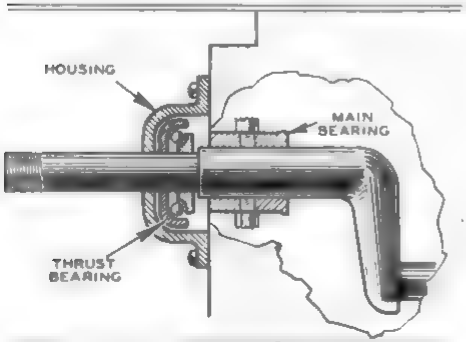
Rohrbach's theory that a piston is kept cool largely because of its speed is novel, but consider this: a piston never overheats and sticks except when moving at a fairly low speed (provided, of course, that lubrication is provided). There is no question that he is correct in saying that a large part of the useful heat generated is carried away by water or air cooling in a normal engine. And the proof that he does reduce that loss to a minimum is the fact that his reaction engine, without any cooling system, runs cool and the hand can be placed on the cylinder at any time.

His engine is not an unproven theory, but something that has been in operation in Germany for five or six years. Financial conditions in Germany since the war have made it virtually impossible to develop new inventions over there, but the Rohrbach drawings and data which I used in preparing the articles are now in the hands of one of America's greatest pleasure car and race car builders, so we may soon hear something more of reaction engines in this country.

Sincerely,
JAY EARLE MILLER.

It's a gift, boys. I get paid for writing this column and the other fellows do all the work.

ALTHOUGH the Pietenpol Air Camper is about as complete a "how-to-build" article as I have ever seen, there always seems to be room for individual improvements.



A sketch of Roy Sorrell's thrust bearing.

Here's a good one:

Calhoun Hotel,
Anniston, Ala.

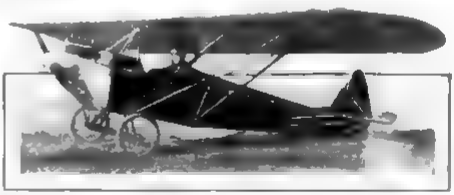
Dear Andy:

I am well under way on my Pietenpol, and in fixing my motor I find that by cutting the flywheel flange off, welding a piece of auto axle 1½" by 8", centering it and dressing it down to 1⅛" and by dressing the front of the crankcase flat I could fit on a thrust bearing and container, thus adding many hours to the life of the motor. Although I am using a Metz motor, this will work on a Model A Ford, and by making a bushing, an OX-5 hub can be used.

In case any of the gang want to try this, I can furnish them with thrust bearings. I also have a few magnetos and hubs I will let the boys have at a reasonable price.

ROY SORRELL.

WHEN anybody asks me, I always warn 'em against trying to teach themselves to fly. However, it can be done, as the Wright Brothers and Wellington Smith of Fort Frances, Ontario, have proved. Below is a photo of Wellington's plane and a letter telling how he did it:



Wellington Smith, President of the Fort Frances, Ontario, Glider Club, built this Heath Parasol and then taught himself to fly it.

Fort Frances, Ontario.

Dear Andy:

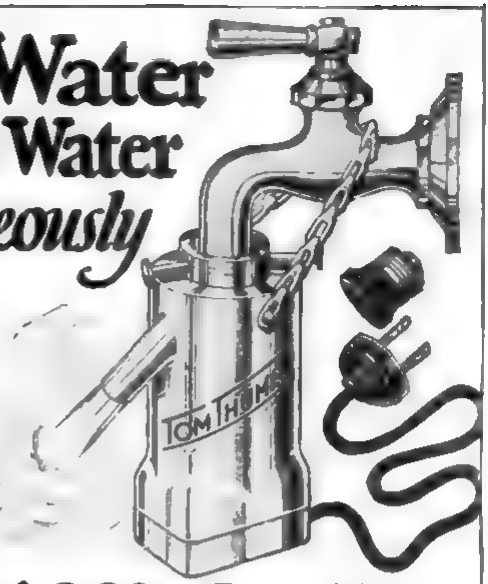
I have enjoyed reading letters in your Mail Box next to what you have to say for yourself, that I always read your column over again. (Editor, please note and acknowledge on next pay check).

I would like to be one of your Canadian "Spies." There may be others, but I have not seen any evidence of their labor in the Mail Box until today. (You're appointed, Duke, buy yourself a pipe, a two-way hat, and a reading glass and go to it.)

Here is a snap of my Heath Parasol built and flown by nobody else but. I started "Man-

(Continued on page 36)

Running Hot Water From Your Cold Water Faucet *Instantaneously*



Only $3.75 Complete

Agents! *This Marvelous Invention Will Make Up to $40.00 a Day Easy*

Just plug in at the nearest electric outlet and presto!—you have instantaneous, continuous running hot water from your cold water faucet. This tells you in a nutshell why the invention of the Tom Thumb automatic electric hot water heater will make it easy for you to make up to $40.00 a day.

The electric heated steaming hot water comes direct from the faucet instantaneously—yes, as quickly as you can turn on the current and the hot water runs indefinitely until you shut off the electricity. The cost is small—convenience is great. Useful wherever hot water is needed—no fuss or bother—attached to any faucet in a jiffy. Works on either AC or DC current. You and your customers will marvel and be delighted at this new discovery of electrical science. The small cost of $3.75 for the Tom Thumb, Junior (110 volts) or $5.75 for Tom Thumb, Senior (220 volts) does the work of any expensive hot water heating equipment costing several hundred dollars—the Tom Thumb absolutely eliminates the plumber or any other additional expense.

No Installation - Stick One On Faucet and Sale Is Made

Think of it! no installation, no extra expense—nothing else to do but to stick it on the faucet, turn on electricity and it is there ready for duty. Easily removed when not wanted and easily carried to any part of house where cold water is running and hot water is wanted. Has many uses—too numerable to mention here. Weighs only 1 lb., made entirely of aluminum. Cannot rust, no moving parts, nothing to get out of order.

If $40 A Day Sounds Good To You Rush Coupon

This new scientific invention offers tremendous sales possibilities. At the low price of $3.75 you should be able to sell at least forty a day. You pocket $1.00 cash commission on every sale. If you would like to know all about this proposition, sign your name and address to coupon or, better still, get started selling at once. Attach money order for $3.75 to coupon and rush to us. We will send complete selling outfit containing 1 Tom Thumb electric hot water heater, order blanks, selling particulars and everything necessary to help you get started making up to $40.00 a day at once.

Terminal Products Co., Inc.,
Dept. 1107, 200 Hudson St.,
New York, N. Y.

The Tom Thumb electric hot water heater looks like a big money maker to me. I am sure interested in knowing how to make up to $40.00 a day with this proposition. I have checked below the proposition I am interested in at this moment.

☐ Enclosed find money order for $3.75. Please send me one Tom Thumb Junior, order blanks and selling information. It is understood upon receipt of this sample outfit I will be permitted to take orders and collect $1.00 cash deposit for every Tom Thumb, Jr. I sell, or $1.50 for every Tom Thumb, Sr. I sell. It is understood I will send the orders to you and you will ship direct to my customers C.O.D. for the balance.

☐ I would like to have additional information before acting as one of your agents. Please send this by return mail free of obligation.

Name .....

Street .....

City ..... State .....

If you live outside of the United States, price is $1.00 extra on each unit, cash with order.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Intensely brilliant, practically luminous, this enough to cover an ordinary dial, at an exorbitant price we here at last succeeded in producing the remarkable LUMINOUS PAINT which applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANTLY SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes and innumerable other articles make your own Luminous Crucifixes, Lamp cords, Fountain pens, Small rattles, **price 25c.** Larger sizes, 50c and $1 postpaid. JOHNSON SMITH & CO. Dept. 967 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better and quicker than ready made. Use your favorite brand of tobacco. Most useful, handy Pocket size, weighs but one ounce. Made entirely of metal, nickel plated. 25c, 3 for 65c.

GOOD LUCK RING

Very striking quaint and modern design. Silver finish skull and breastbone design two brilliant flashing gems of the eyes. Said to bring a good luck. **Only 25c ppd.**

Exploding Cigarettes

Box contains ten genuine regulation cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third an end, the victim gets a very great surprise as it goes off with a loud BANG! A great trick with preacher yet entirely harmless. **Price 25c box.**

NOVELTY BADGES

Missing Person 10c Game Inspector 10c

Two very neat metal badges nickel plated, that you can wear giving you fun out of all proportion to their selling cost. 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. As the victim tries to light one he gets quite a surprise. **Price 10c per box, 3 boxes for 25c, 12 for 75 cents.**

MIDGET BIBLE

GREAT CURIOSITY! Smallest Bible in the World. Size of a postage stamp. 2,000 pages. Read to bring good luck to the owner. A genuine work of art. Makes a fine gift. Will be appreciated. Make good money selling them to friends, acquaintances, etc. PRICE 15c each; 3 for 40c, 12 for $1.25, 100 for $7.50. Also obtainable in leather binding and gold letters. Price 50c each, 3 for $1.25, $4.50 per doz. Magnifying Glass for use with Midget Bible 15c.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 25c, 120 for 50c, or $3.50 thousand postpaid.**

NOSE FLUTE

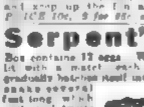
The Magic Nose Flute or Humanatone is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which when once acquired after a little practice will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering and you can be mastered in you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is so charming as it is surprising.

Post Paid **10c**

Wonderful X-Ray Tube

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the water or opening in a pen nib and many other similar illusions. **Price 10c, 3 for 25c.**

NOSEBLOWER



When some men blow their nose it sounds like a trombone. Now the *NOSE BLOWER* has come to torment us. It is a starter. It is ingeniously concealed in the handkerchief. Proceed to blow your nose and your friends will think they heard a steam engine or something. You can imagine their astonishment your having a very bad cold and keep up the fun as long as you like. **10c postpaid. 3 for 25c.**

Serpent's Eggs

Box contains 12 eggs. When lit with a match each one gradually hatches itself into a snake several feet long which curls and twists about in a most lifelike manner. **Price per box, 10c postpaid 3 for 25c.**

BLANK CARTRIDGE PISTOL

Protection against Burglars, Tramps, & Dogs **Special Offer**

Well made and effective, modelled on latest type of Revolver; appearance a cope to scare a burglar. When needed it may be as effective as a real revolver without danger to life. It takes standard 22 Cal. Blank Cartridges—obtainable everywhere. Special cash with order offer: 1 Superior quality Blank Cartridge Pistol, 100 Blank Cartridges and our new 550 page De Luxe Catalog of latest novelties; all for **ONLY $1.50.** Shipped by Express only. Cannot go by parcel post. Extra Blank Cartridges 50c per 100. Special Holster (Cowboy type) for pistol 50c. No C. O. D. shipments.

1 Blank Cartridge Pistol
100 Blank Cartridges
1 550 page New Up to Date Catalog
ONLY $1.50
The Lot Shipped by Express Only
Cash With Order Only

Combination Thrift Vault and Savings Bank

A MINIATURE VAULT BANK HAS REAL THREE NUMBER COMBINATION LOCK KEYLESS—CANNOT BE PICKED

Your money and valuables will be perfectly safe in this new Combination Thrift Vault and Savings Bank. It is modelled on a real combination lock just like the regular Safes and Vaults. The lock requires three numbers to open it. There are over 64,000 different combinations. The lock is quick proof. It cannot be opened by fastening for the right combination because it operates silently like the lock on a safe or vault. It is keyless in every sense of the word. No key is required. Once you learn the combination it can be opened in a moment or two. It takes command any size coin up to a quarter and is amazing. Ideal for keeping jewelry and other valuable articles and other private memorandums, etc., from prying eyes. Coins and currency can be placed in the bank by simply dropping it in the slot at the top but the larger articles must necessitate opening the bank by means of the combination. The money cannot be shaken out of the bank.

It is strong and serviceable, being constructed of the finest sheet steel, enamelled black and with dial and figures presenting a most pleasing appearance to the eye and an attractive ornament in the home. It is large enough for the desk or parlor and yet enough to carry in the coat pocket. It can be used as a paper weight on the desk. It is novel, new and attractive. Each Bank comes complete with perforated directions of opening and closing and the secret combination, and packed in a neat box, making a splendid gift parcel. **Price postpaid, in any address in the world. $1.50**

125 CARD TRICKS

Containing all the tricks and diversions with cards ever invented, including the latest Tricks of the most celebrated Conjurers, Magicians and Prestidigitateurs. Carefully retouched, amplified and adapted for home amusement and social entertainment. The whole so explained that any person with a little practice, perform the most difficult feat to their own satisfaction and to the wonder and astonishment of friends. There is also added a Complete Exposure of all the Card Tricks by which the Sharpers fleece Card Players and Gamblers. 100 pages. **25c postpaid.**

MAGIC FOR AMATEUR MAGICIAN. Complete with cards, coins, etc; experiments in mechanics, chemistry, electricity, etc. **10c postpaid.**

Tricks & Social Entertainer

Cleverly performed feats of conjuring, sleight-of-hand and illusion interest everybody, and ability to do such always makes one a welcome guest. This is a book of 96 pages, with nearly 100 illustrations. The instructions are so plain and so plainly given that even a child, with a little practice, can do them, as they only require SIMPLE APPARATUS. The book gives full and clear explanations of an unusually large number of clever tricks of all kinds. In addition there is a chapter on SECOND SIGHT" a combination of five different methods which baffle the most astute investigators. **25c postpaid.**

MILLER'S BOOK OF MAGIC. Magic and its mysteries. Numerous simple parlor tricks explained and illustrated. 100 pages. **25c postpaid.**

MICROPHONE TRANSMITTER BUTTON

$1.00 Postpaid

You can easily make a highly sensitive detective phone by using this Transmitter Button to conceal the microphone. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can conceal the microphone of a hotel. This outfit was used by secret service operatives during the war. It is being used on the stage. It is extra sensitive and picks up the slightest sounds. You can mount the button almost anywhere—card board boxes, store signs, calendars on the wall behind a picture frame, etc. Button is light and small and cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person with the assistance can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard hundreds of feet away. Button may be used to renew telephone transmitters, often makes an old line "talk up" when nothing else will. The ideal sportsphone for radio use across every current and to extremely sensitive. Amplifies radio signals. Countless other uses will suggest themselves. Experimenters find this button useful for hundreds of experiments along the lines of telephones, amplifiers, loud speakers, etc. Many fascinating stunts may be devised such as holding the button against the throat or chest to reproduce speech without sound waves. **PRICE $1.00.**

JOHNSON SMITH & CO., Dept. 967 RACINE, WIS.

JOHNSON SMITH & CO.

Dept. 967 RACINE, WIS.

A De Luxe Edition of our new CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind in existence. Nearly 600 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in needs and goods of all kinds not obtainable elsewhere. Remit by Coin, Money Order, Check or unused U. S., Canadian and Foreign Stamps for all articles listed above. *See next page also*

BOYS! BOYS! BOYS!

THROW YOUR VOICE

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

The Ventrilo

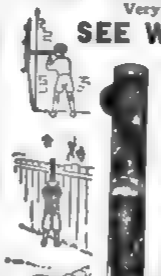
is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful DOUBLE THROAT, or VENTRILO, you can imitate many kinds of birds, animals, etc. Remember you get everything for ONLY TEN CENTS—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the Double Throat, or Ventrilo, and our big catalog of novelties, tricks, puzzles, masks, books, etc.

All Sent Postpaid to Any Address for Only 10c

THE DANDY PERISCOPE

Very Interesting and Amusing Novelty

SEE WITHOUT BEING SEEN



Look Over the Heads of the Tallest Men in a Crowd.

See Over a Fence, Around Corners, Etc.

LOTS OF FUN AND AMUSEMENT

Strongly Made. Equipped with Mirrors, Sight-Finder and Eye-Piece.

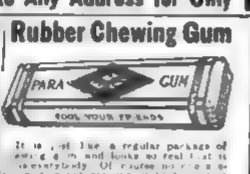
THIS is the same kind of instrument that the soldiers use in the trenches to watch the enemy without risk of being seen themselves and every submarine has one for use at the surface of the sea to keep a lookout for other vessels, etc. With it you can gaze over a high wall or see around a corner without being seen yourself. For if you are in a crowd you can look right over the heads of the tallest men and watch all the fun. Our illustration will give you some idea as to the numerous ways in which the Periscope can be put. Every Boy and Girl should have one for spying and anyone can who wants a pure rare amusement. The Dandy Periscope is very strongly made of the highest handling and the hardest wear, and with kind care will last a lifetime. It measures 17 inches long and is covered with black leatherette handsomely decorated with nickeled designs to show many of its uses, and each one is complete in box.

Price Postpaid to any Address $1.00

INVISIBLE INK

The most confidential messages can be written with this ink, but the writing makes no mark. Cannot be seen even when held before fire or lamp. Keeps your private and other private memorandums away from prying eyes. Great fun for playing tricks on your friends. Only 15c a Bottle, 3 for 40c.

Rubber Chewing Gum



It is just like a regular package of chewing gum and looks so real that it is invariably fooled. Of course no one [illegible] but the unsuspecting ones. There's a world of fun in this rubber chewing gum—5 pieces to a package. Price, 10c Pkg.; 3 for 25c; 12 for 75c postpaid.

Box 10c Rubber Cigars, Price Ea. 10c

Rubber Cigarettes. Price per Box 20c
Rubber Matches. Price per Pkg. 10c

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is passed back and forth from one vase to the other, although placing the lid has disappeared and is found in someone else's pocket); the HINDOO TRICK CABINET (made of wood and completely no less than five times. DISAPPEARING COIN BOX (a pie edition wooden box, vanishes entirely or changes into a box of another denomination. The GLASS GOBLET TRICK (a nine dropped into a glass of water and when the water is poured out the coin has vanished and will [illegible] appear under the RIBBON FACTORY FROM THE MULTIPLICATION (a nine dropped into a glass of water and when the water is poured out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WILLIAMS RING COIN TRICK; the ENCHANTED BOTTLE TRICK (a coin [illegible] to appear in a bottle); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat disappears, and is found underneath); yet no one has [illegible] the last, and last but not least, the GREAT MAGIC CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid. JOHNSON SMITH & CO.**

U. S. BABY TANK

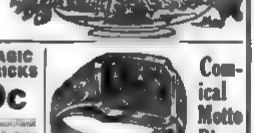
25 Cents

It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward and forward with the hand or [illegible] for table and then pushing it down, it will travel along [illegible] angles, in the same manner as the larger tanks that proved so deadly in the great war. What makes it go is a mystery for there is no engine to be [illegible] and without any [illegible] pull. Has [illegible] and runs longer than the old-style toy. It will [illegible] [illegible] pivots. 2½ inches long. Price only 25c prepaid. Stamps accepted. JOHNSON SMITH & CO.

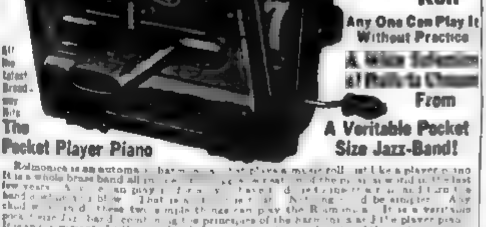
RESURRECTION PLANT

Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep until put in water again. PRICE, 10c. 3 for 25c. 75c per dozen, postpaid.



ROLMONICA

$1.50



A Mouth Organ that Plays with a Music Roll

Any One Can Play It Without Practice

From

A Veritable Pocket Size Jazz-Band!

All the Latest Broadway Hits

The Pocket Player Piano

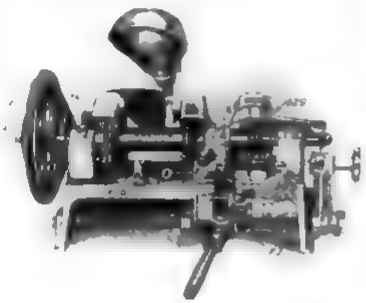
Rolmonica is an automatic harmonica that plays a music roll just like a player piano. It is a whole brass band all in one instrument. Any tune you want is [illegible] the few years. Anyone can play [illegible] instrument in a few minutes. [illegible] band effects by blowing [illegible] Rolmonica [illegible] simple. Any child can play it. Some of these tunes are: Rolmonica Rag, Alexander's Ragtime Band, Yankee Doodle, Anna Lotze, Sidewalks of New York, Hiawatha, Wedding Bells Are Breaking Up That Old Gang of Mine, Ragtime Violin, Alcoholic Ramona, Just the Way You Look Tonight, Sailor Boy, Dreams, Carolina Moon, I Love You Truly, Mammy, Old Folks at Home, Yankee Doodle Boy, Over There, Marching Through Georgia, Auld Lang Syne, Home Sweet Home, Tipperary, Marseillaise, Red Wing, The Parade, Sweet Adaline, Pretty Eyes, Poor Old Joe, Feeling Fresh, Love Among the Roses, Weary River, Love Me and the World Is Mine, Dixie Land, Sleepy Water, Turkey in the Straw, Old Black Joe, Old Folks at Home

Earn Big Profits Making Keys

Build a Permanent Business of Your Own

You can be the one in your territory to make big profits in duplicating keys and making keys by number of locks. With the Beisser Key Machine you can duplicate any type of key in less than one minute. You can make new keys from lock numbers. No experience is necessary. A boy or girl can operate this simple machine, which is easily operated and *fully guaranteed*

One girl took in $98.30 her first week. We can show you how to be independent, too



Beisser Codes and Guides enable you to make first keys for automobile transmissions, door locks, steering wheels and ignitions, as well as for padlocks, etc. There is no need to take the lock apart.

A Revolutionary Machine

The Beisser is revolutionary, incorporating advanced features hitherto undreamed of. It is the simplest key machine ever perfected, and is earning hundreds of dollars for users throughout the world.

If you want to be independent, or add a highly profitable department that will attract people to your present business, fill in the coupon below and mail today

MAIL THIS COUPON

Beisser Key Machine Co.,
Woodward at Alexandrine
Detroit, Michigan.

I am interested in your money making proposition. Send me full information without obligation

Name .....

Address .....

City ..... State .....

Beisser Key Machine Co.,
Woodward at Alexandrine
DETROIT
MICH.

WRITE FOR FREE CIRCULAR

ANDY'S SHOP MAIL BOX

(Continued from page 32)

ufacturing" the end of January, 1930, and flew it off the ice on Ray Lake November 23. I spent a few hours taxiing it around on the smooth ice until I got used to the controls and was able to hold a straight course with the tail up in flying position.

I have never had flying instruction except that found in M.M. and other air-minded publications. I enjoyed a number of hops from one to six feet off the ice, then I went up once to twenty feet but I came down too hard, for the landing gear struts came up through the longerons and I had to lay up the ship for repairs.

I had my Heath off on skis January first. It flies good and lands softer on the snow, yet I brought it down twice with quite a bump and it's still whole.

Yours truly,
WELLINGTON SMITH.

Well, that's one way of doing it, and one is forced to admire a fellow who will take off without previous instruction, but when you figure the price of new landing gear and perhaps flowers and doctor bills, it seems to me that at least a couple of hundred spent on flying lessons is a good investment. One crash, caused by inexperience, can cost a lot more than that. I'm putting it in terms of money, because I know that most of us flying bugs don't put any real value upon our necks.

MOST of the radio fans write direct to the editor of that department, hence the rarity of letters on that subject in the Mail Box. Here's one, however, which should interest the disciples of Marconi:

1708 W. Main St.,
Fort Wayne, Ind.

Hello Andy:

Boy, I've sure got to hand it to you and Double M for publishing the sweetest mag I ever read.

My pet hobbies are airplanes and radio, and I've been working on both until someone thought I should do something to help the unemployment situation, so I gave up my job (by request) and started to collect debts. (Gosh man, you don't have to give up your job to do that, although it helps quite a bit.)

I built up that one-tube radio you fellows printed in your first issue and I want to say that she sure "hands 'em over" for just having one lung.

The author promised to print a few stages of audio to hook onto it, but I haven't seen them, so I'm sending in a special complaint. (They're coming up, Bill.)

Yours truly,
WILLIAM P. BARTE.

(Continued on page 38)

SIX WONDERFUL BARGAINS

The FOTH ROLL FILM CAMERA

Makes 2¼"x3¼" pictures. Has double anastigmat 4.5 lens. Takes pictures on dark days and in the shade. Shutter speeds 1/25 to 1/100 second. Handy, radial focusing lever makes focusing easy. Automatic, built in self timing device enables operator to take his own picture. All metal construction. Genuine leather cover. Send $3.00. Pay postman $15 plus small postage. Satisfaction positively guaranteed.

$18

EXPO WATCH CAMERA

SEND ONLY $1

No bigger than a watch. Makes marvelous sharp pictures 5/8"x5/8", that can be enlarged up to 3¼"x4¾". No focusing. Press the button and the picture is yours. Time and Instantaneous shutter. Loads in daylight. 20 exposure film costs only 30 cents. Send $1 for Camera and film. Pay postman $1 plus postage. Money back guarantee completely protects you. Send today.

NEW PENCIL MICROSCOPE

SEND ONLY $1

For home, office, school and field. Magnifies 40, 50, 60 diameters for examining minerals, ores, textiles, etc. Has mirror reflector and dust cap. Complete with pocket clip. $3.95. Send $1. Pay postman $2.95 plus postage. Fully guaranteed.

NEW CENTRAL BAROMETER

Genuine aneroid construction. Forecasts the weather 12 to 24 hours in advance. Finely made. A precision instrument in every way. Should be in every home. Up to 5,000 ft. elevation. Only $2.98. For limited time. Send $1. Pay postman $1.98 plus postage. Don't wait. Send now.

LOMARA MICROSCOPE

SEND ONLY $1

50 POWER. Magnifies 15-25-40 or 50 diameters at will. For naturalists, doctors, chemists, botanists and engineers. A real precision instrument of finest optics. Send only $1. Pay postman $5.75 plus postage. 200 power objective lens, $4 extra. Stand with complete stage and reflectors, $4. Order now.

WALLENSAK BIOSCOPE

SEND ONLY $1

For bird students, tourists and theatre goers. A versatile glass. Six power. Precision adjustments. Compensates for astigmatism. Regularly $5.95. Send $1. Pay postman $2.98 plus postage. Satisfaction guaranteed. Order today.

BIG BARGAIN BOOK FREE

288 pages of tool and photographic bargains in best ... "11" money back guarantee. Send for it. Write today.

CENTRAL CAMERA CO.

230 S. WABASH AVE., DEPT. 17, CHICAGO

$7.00 A Month for this 9"x 2' Back-Geared Special Metal Turning SOUTH BEND PRECISION BENCH LATHE

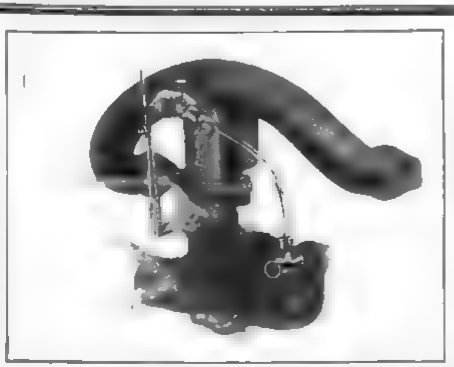
9¼" swing . . . Precision type . . . ¾" hole thru spindle . . . Phosphor bronze bearings . . . Back-geared headstock . . . Set over tail-stock . . . Graduated compound rest . . . Cone pulley steps 1" wide . . . Bed lengths 2' to 4½' with between center distances, 5" to 38".

The No. 20 9" Special is our regular Quick Change Gear Lathe stripped of all extras not needed in the small shop. Used for manufacturing, machine shop, repairing, automobile servicing, etc. Suitable for all turning jobs in cast iron, steel, brass, aluminum, bronze, wood, fibre, etc. *WRITE NOW* for descriptive circular—also catalog of other sizes up to 24" swing at $2,000.

Weight 350 lbs. Price, with countershaft and equipment, only **$100**

SOUTH BEND LATHE WORKS

861 East Madison Street — South Bend, Indiana, U. S. A.



WOLVERTON POWER BOOSTER

by P. B. WOLVERTON, Inventor of "Free Wheeling"

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ANDY'S SHOP MAIL BOX

(Continued from page 36)

A Rhon Ranger glider built by Cedric Maltpress.

AND now let's see what the glider fans are doing. That snap up above seems to be a neat job. I'll let the builder tell you about it:

Edgerton, Wis.

Dear Sirs: (Me and who else?)

I am enclosing a picture of a Rhon-Ranger glider which I built at home. I am an amateur builder and this is my first craft. It would fly all right if I knew how to fly. I have had it off the ground several times and I made a flight of 100 feet behind a car.

Would common paint be all right to paint this ship with?

Yours truly,
CEDRIC MALTPRESS.

If you mean the wooden frame, Cedric, why ordinary paint is okay, but fevvens sake, don't use anything but good wing-dope on the fabric.

THE spirit of good fellowship and mutual helpfulness is prevalent (or should be) in all lodges, clubs, fraternities, sororities, or what have you; and the Double M Hangar Gang is no exception. Letters this month are fairly brimming over with helpful suggestions, some of which have been paid for and will be found under "Handikinks" in the middle of the book. Others, which were accompanied by no "art" are doled out to you gratis as the spirit (No, you dope! not spirits) moves me. Boat owners will be interested in what follows:

Los Angeles, Calif.

Andy old Grease Monk:

Just got the May number of M-M, and from what you put in your space, there are two people in this world who deserve a medal of honor or a like decoration. One of them is Alvia Peters who has done more for the boys in the state of California than Governor Rolph (all apologies). The other is B. H. Pietenpol. By the way, how about running a photo of Pietenpol? (Well, Pete, how about it?)

Here's a little useful dope maybe, to the people who use auto engines in their boats (marine):

(Continued on page 40)

PROOF IN 7 DAYS THAT YOU CAN BE THIS NEW MAN!

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By CHARLES ATLAS

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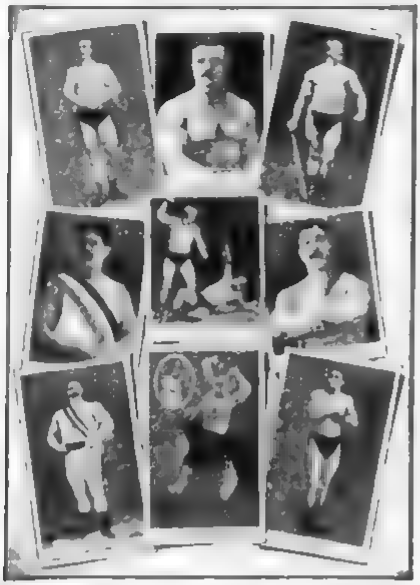

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ANDY'S SHOP MAIL BOX

(Continued from page 38)

If they will take a 25% solution of sulphuric, muratic or picric acid and flush the water jackets of said engine until the rust has vanished, then repeat the process using copper sulphate or blue-stone 50% solution, they can curtail the action of salt water or any water reacting on the rough inside castings.

At a later date I'll have some pictures of a honey of a BUG. I mean a car I built from a Star. Here's the idea of what I mean: 38" tread, 72" wheelbase, 15" frame in front and 26" in the rear. 20x4 airplane wheels, drive shaft 6" long. Does 65 m.p.h.

Hoping I haven't bored you,
As ever, R. H. EICHHOM.

Not at all, R. H., you've interested us mightily. How about entering that bus of yours in the "Baby Auto" contest announced in the June issue?

AS YOU probably have noticed, some of the gang are air fans, some are bugs on radio, while others like to build their own racing cars or boats. Here, however, we have the kind of fellow the editors dream about but seldom find—one who devours everything and hollers for more of the same.

Slatington, Pa.

Dear Andy:

I read your Shop Mail Box every month first thing. I like your line of informal chatter. I also like the pictures of planes, ice boats, etc., that fill up space in your column.

I took MODERN MECHANICS and INVENTIONS all last year at the news stands and I have a subscription this year. I like light planes, but as I am only a freshman in High School I have neither the money nor ability to build anything outside of models.

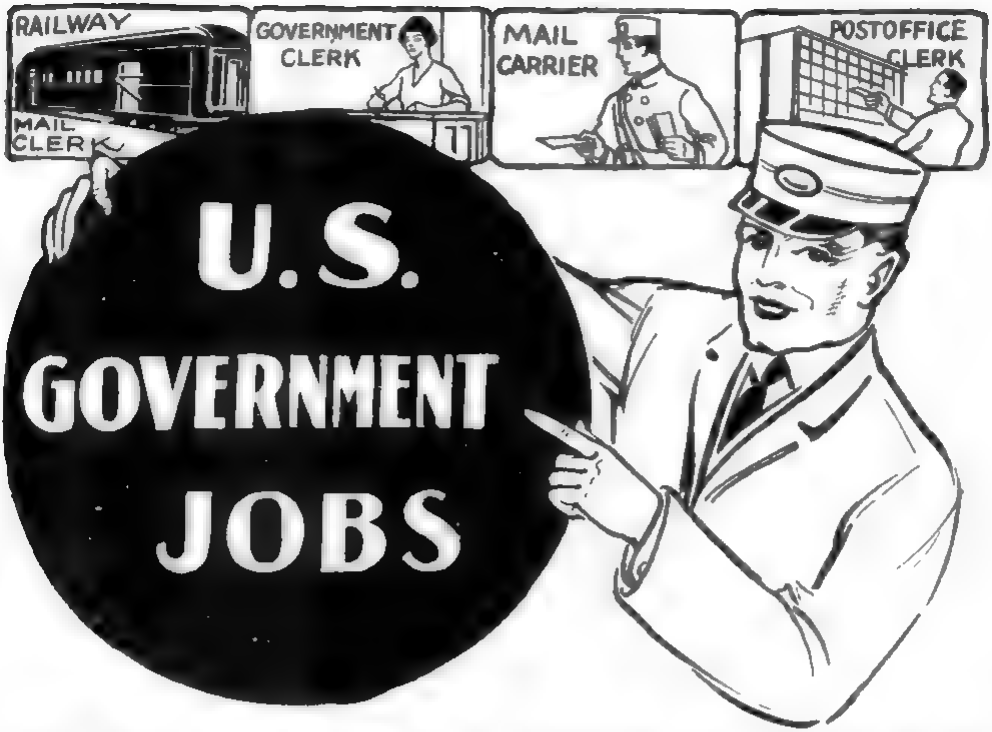
I would like another glider article like the one in the December issue by Lieut. H. A. Reynolds (a sea-glider if possible). Dick Cole is my favorite author (Ah there, Dick!)

I like short wave articles, and would like to have a little set that you could carry around and use a fence wire for an aerial. (Now there's an idea.) I also favor articles on Ford car tinkerings, but not overhead valves and expensive stuff like that Chevrolet racing article in the April issue (Boy, you ought to see the fellows that did like that one). I like articles like "Just for Fun," by Kenneth Murray.

Well, I guess that's enough, so
So Long,
CLYDE THOMAS.

I'm always glad to get such letters, telling me what you like and what you're not so keen about. I pass the dope on to the editors, and it helps them to pick the kind of stuff that makes you happy.

(Continued on page 42)



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ANDY'S SHOP MAIL BOX

(Continued from page 40)

BEFORE closing I'll have to print one more letter from a fella who's tryin' his durndist to imitate my style:

Pullman, Washington.

Dear Andy:

Well, well, well, ol' boy, ol' boy, ol' boy, so yer finally got the works of a tin horse into one of these hear airyplanes. I ain't much of a hand with tools, but I aim ter give this hear sky-buggy o' yourn a triout this summer, and if it don't fly then gosh darn yer old hyde, yer better hunt a hole 'cause I'll be gunnen fer yer.

Ye see, Andy, I am going to a swell collitch out hear and ain't got no money to start yet, so I'll wate until I git all the M-M plans, and boy howdy, I'm gonna make a sky-horse wot I kin ride hear an' there to with.

Ya know, ol' socks, we westerners have waiten a long time ter hear about a sky-hors what we kin aford ter buy. No fussy trimmins but a good gosh darn airyplane wot could ride two people all day long an' not git tired an' want to lay down an' rest.

This little airyplane yer got into the m.m. now is sure the shoes off my best horse. I always wanted a airyplane all my own, and as soon as yer gits goin' an' whips them horses (editors) inter lettin' yer have the say-so aroun' there we'll have all the plans in a jiffy and maybe have a better mag.

Now, chief, that all that follishness is over, I want to explain it. I am a student at W.S.C. and try to get YOUR mag as soon as it gets out. I have been studying the plans of the Pietenpol Air Camper and wish to express my appreciation of the wonderful work in those plans. I have been looking forward to the day when an easy-to-build two-seater plane would be offered to the public, and I think I have found it in the Air Camper. However, I won't start building until I have the full set of plans.

Sincerely,
KENNETH FIGG.

WELL, Ken, that makes it unanimous. Now that you're in, I believe that everybody who can salvage a Model "A" motor is going in for building the camper. Incidentally, if any of you fellows want to get parts for this job, just drop a line to B. H. Pietenpol, Spring Valley, Minnesota. He'll send you a price-list of materials pronto. Pete is also in a position to do any welding or other work on this job which might be a little too much for your limited workshop.

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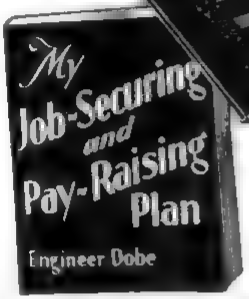

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Sham WAR Demonstrates

Photo shows bombers flying in formation over New York City in the First Air Division demonstration.

by CAPT. T. R. PHILLIPS, U. S. Army

Immense fleets of fighting planes directed in battle by radioed orders from a flying general—deadly new attack planes carrying a quarter ton of bombs and capable of firing 3000 shots a minute—these are a few of the latest developments in aerial warfare demonstrated in an amazing sham air war. Don't fail to read this authoritative article if you take pride in keeping informed on Uncle Sam's defense system.

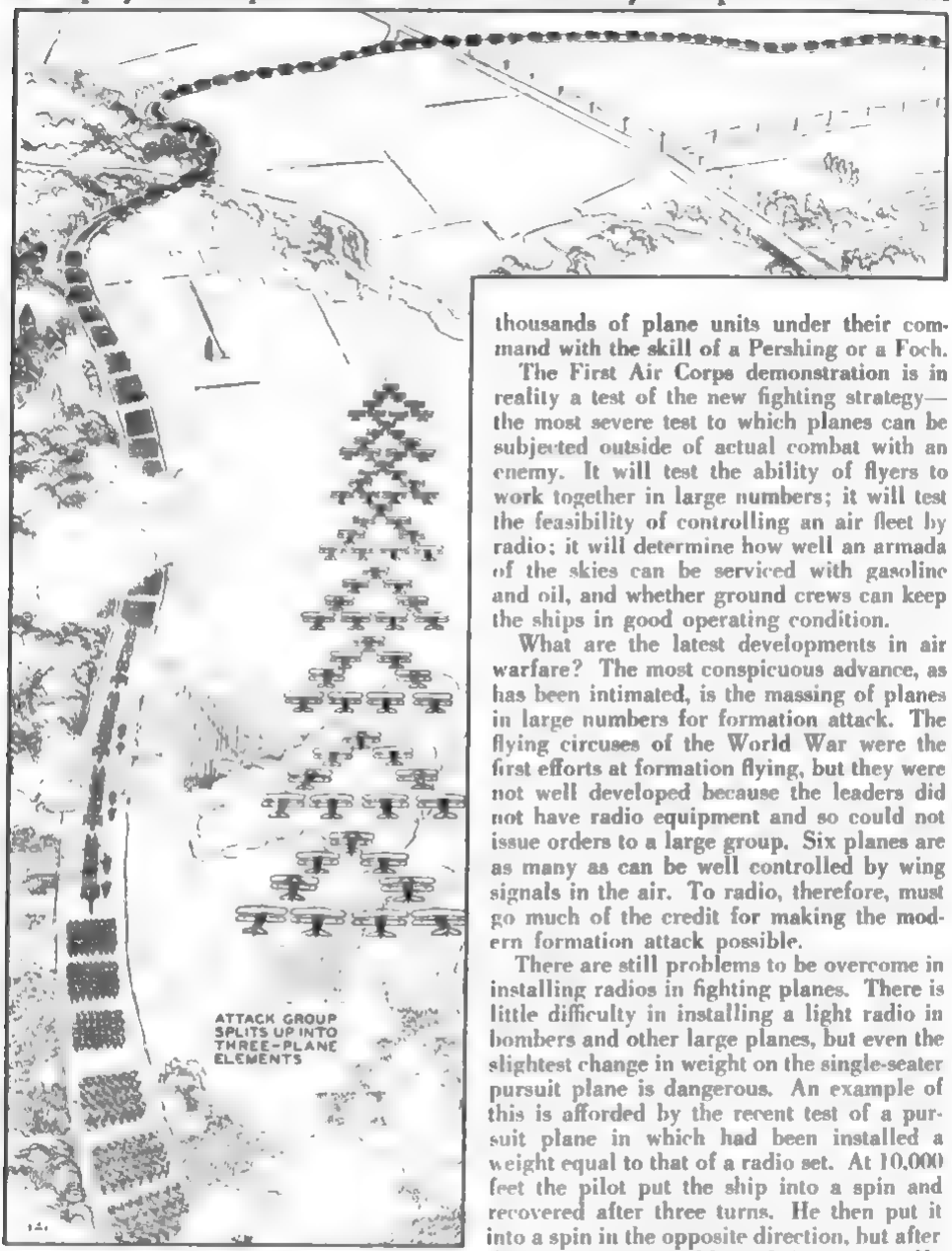
STAGING the most amazing sham air war in all history, 672 fighting planes of the U. S. Air Corps, assembled from all corners of the country, recently engaged in mimic battle over the skyscrapers of New York, dropping dummy bombs on the financial district, laying smoke screens, attacking in formations, and otherwise demonstrating the latest developments in air attack strategy which will be used in the next war, if and when it comes.

New York is not the only city to witness this impressive demonstration. Even as you read these lines, the First Air Division will be repeating its performances over most of the large cities of the nation. In fact, before the planes return to their home bases it is estimated that 70,000,000 people will have witnessed their maneuvers. More than 2,000,000 miles will be flown and half a million gallons of gasoline consumed.

What is the purpose of this vast concentration of fighting planes? It is not just an impressive aerial parade—it marks the end of that glamorous fighting era of the World War in which the flying heroes were the Rickenbackers, Guynemers, and Bishops, famous aces of individual combat. Those days are gone forever. The aerial heroes of future wars will be flying generals who direct

Typical methods of air warfare are illustrated in this drawing of the sham battle over New York. Note the three tiers of pursuit planes, protecting the bombers which fly at a low altitude to drop their "eggs." Smoke screens laid by plane hide the city from the enemy. The planes fly in group formation and act on radioed instructions from their flying leaders. Insert map shows route of sham attack.

Group of 100 Airplanes Can Bomb 14 Miles of Troops in One Minute



Attack aviation, in which low-flying planes drop bombs and spray ground targets with machine gun fire, is a post-war development of extreme importance. As shown above, an attack group of a hundred planes can bomb a 14-mile column of troops in one minute. The formation splits into three-plane elements, as shown in red, on signal from the attack leader.

thousands of plane units under their command with the skill of a Pershing or a Foch.

The First Air Corps demonstration is in reality a test of the new fighting strategy—the most severe test to which planes can be subjected outside of actual combat with an enemy. It will test the ability of flyers to work together in large numbers; it will test the feasibility of controlling an air fleet by radio; it will determine how well an armada of the skies can be serviced with gasoline and oil, and whether ground crews can keep the ships in good operating condition.

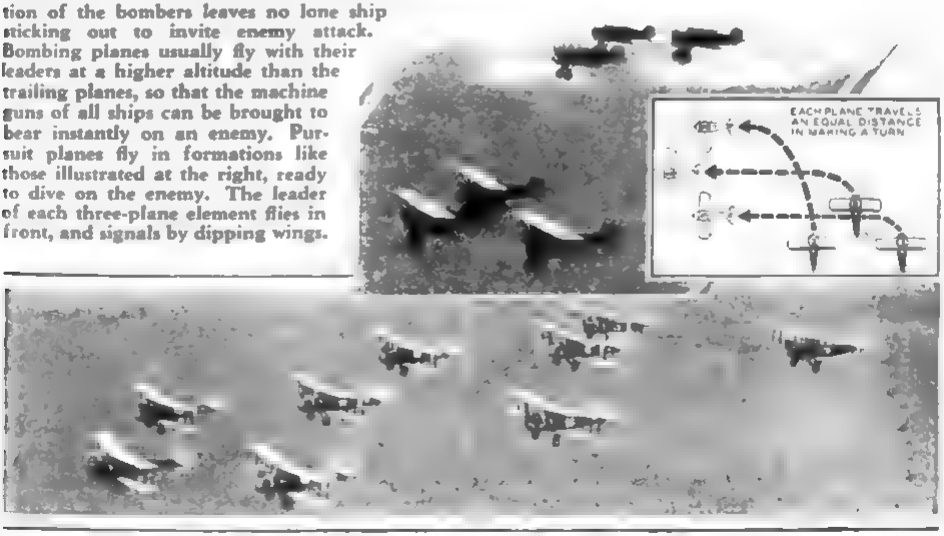
What are the latest developments in air warfare? The most conspicuous advance, as has been intimated, is the massing of planes in large numbers for formation attack. The flying circuses of the World War were the first efforts at formation flying, but they were not well developed because the leaders did not have radio equipment and so could not issue orders to a large group. Six planes are as many as can be well controlled by wing signals in the air. To radio, therefore, must go much of the credit for making the modern formation attack possible.

There are still problems to be overcome in installing radios in fighting planes. There is little difficulty in installing a light radio in bombers and other large planes, but even the slightest change in weight on the single-seater pursuit plane is dangerous. An example of this is afforded by the recent test of a pursuit plane in which had been installed a weight equal to that of a radio set. At 10,000 feet the pilot put the ship into a spin and recovered after three turns. He then put it into a spin in the opposite direction, but after three turns was unable to bring it out. He tried every maneuver possible until he had lost 7,000 feet altitude and had to jump to save his life.

Attack aviation is another distinctly new development. Its specialty is the bombing of troops, anti-aircraft batteries, supply trains

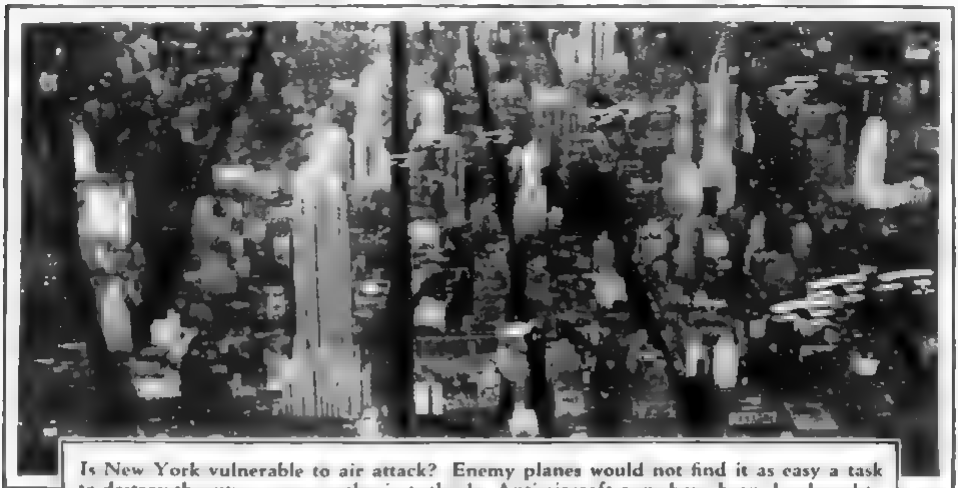
These Flight Formations Illustrate Principles of New Attack Strategy

Above is an excellent photo showing the adaptation of formation flying to modern methods of aerial warfare. The large group of planes are bombers, twin-motored ships with heavy cargoes of explosives which do not fight except defensively. They are convoyed by fleet pursuit ships flying far above them, ready to pounce on enemy fighters and fend them off. Note that the close formation of the bombers leaves no lone ship sticking out to invite enemy attack. Bombing planes usually fly with their leaders at a higher altitude than the trailing planes, so that the machine guns of all ships can be brought to bear instantly on an enemy. Pursuit planes fly in formations like those illustrated at the right, ready to dive on the enemy. The leader of each three-plane element flies in front, and signals by dipping wings.

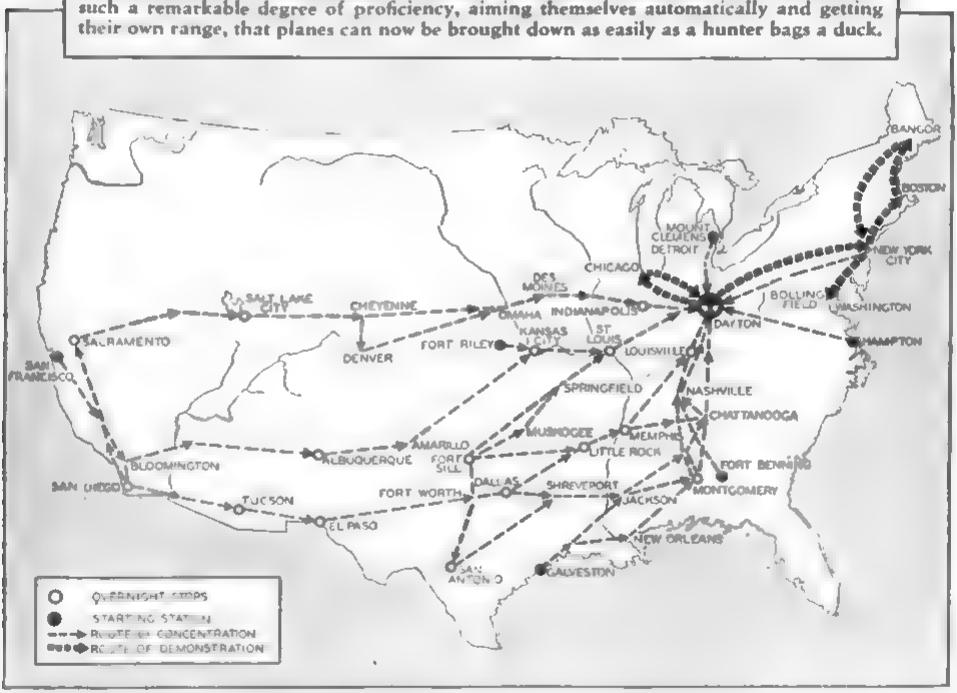


This photo shows a flight of bombers. In addition to pursuit planes flying above to protect them from enemy fighters, bombers are frequently escorted by attack planes flying below them at altitudes of 500 feet to drop bombs on the anti-aircraft batteries. The insert drawing shows the method of a three-plane element in making a turn. As illustrated, each plane travels approximately the same distance.

Anti-Aircraft Guns Are Effective Defense Against Planes Attacking City



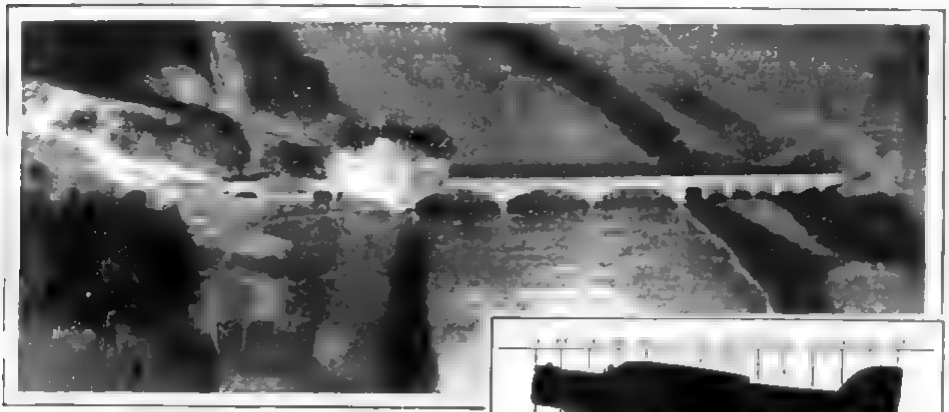
Is New York vulnerable to air attack? Enemy planes would not find it as easy a task to destroy the city as some enthusiasts think. Anti-aircraft guns have been developed to such a remarkable degree of proficiency, aiming themselves automatically and getting their own range, that planes can now be brought down as easily as a hunter bags a duck.



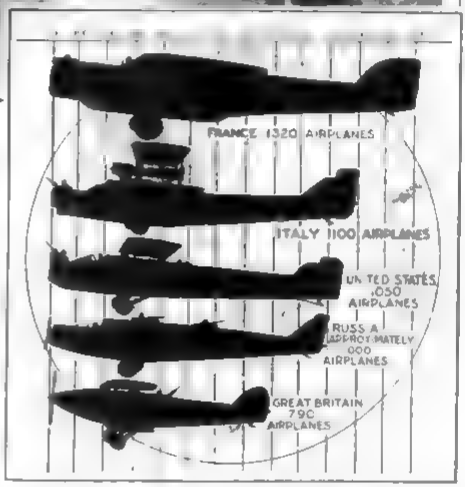
This map shows the route of assembly of the 672 planes of the First Air Division, which concentrated at Dayton, Ohio, and started from there on its tour of the country. With the return routes (not shown on the map) every city of importance in the country will have been visited by the vast air fleet.

and planes when on the ground. They approach their game hedge-hopping and tree-dodging, and drop their bombs and are away almost before the unfortunate target knows what is happening. They fly too low to be hit by the 3-inch guns of the "Archies" and are in and out of machine gun range in less than a minute and may be in sight for only a few seconds.

An attack group with its hundred planes



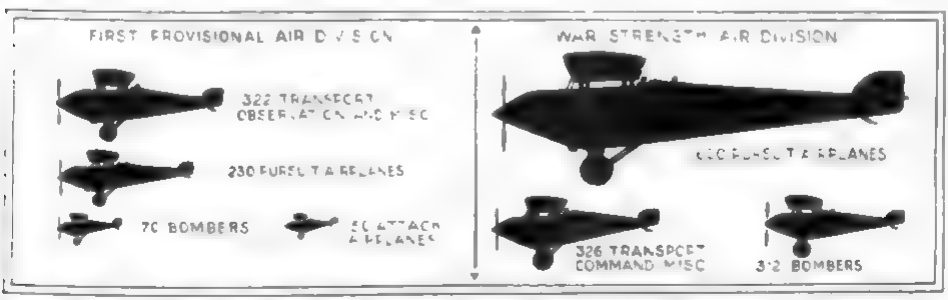
A 600-lb. air bomb dropped on this concrete bridge, slated for destruction, did comparatively little damage. It required an 1100-lb. bomb to demolish the section visible at the left of the explosion in the above photo.



A graphic comparison of the air strengths of the great powers, as represented by the number of their planes, is presented above. The United States has approximately 1050 airplanes distributed among the Army, Navy, and Marine Corps.

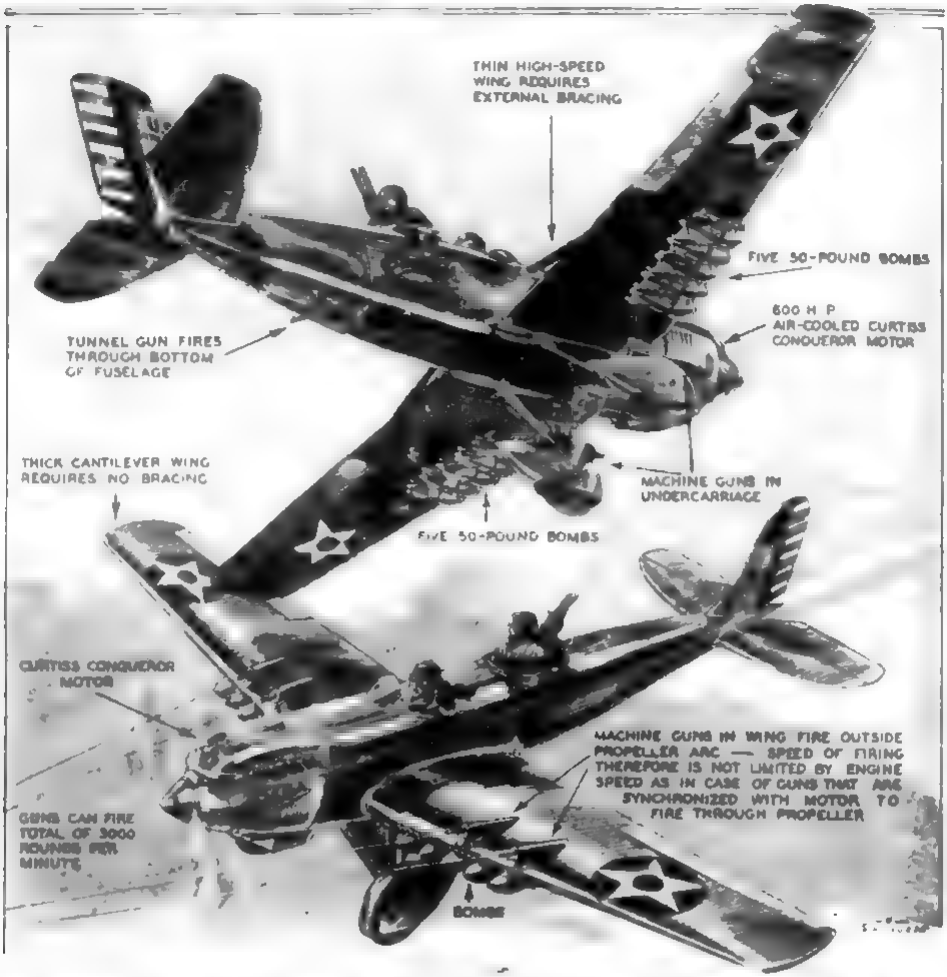
can bomb the entire fourteen-mile length of a division of troops, 20,000 men, in a minute and be on their way. To do this they would split up into three plane elements, as they approached the division, each element assigned to a definite portion of the division. All would dive on the column at the same moment with machine guns belching, straighten out, and fly along the heads of the troops dropping their bombs at intervals. The three planes of each element fly as one, the two rear planes guiding on the leader. Action is fast; the pilot must fly his plane, use his machine guns and drop his bombs all at the same time. The attack plane has four forward pointing machine guns and two defensive guns over the rear cockpit. It can carry three hundred pounds of bombs.

Attack aviation was unknown as a separate type at the end of the World War, although the Germans had formed a couple of squadrons, shortly before the armistice, whose business was to operate as attack does



Compare the strength of the First Air Division—all the fighting planes the Army could muster—with the ideal strength of a war division. The war strength drawing shows no attack planes, which are considered as elements of ground warfare. The United States ranks third in number of airplanes.

Secret "Flying Tanks" Fire 3000 Shots Per Minute, Carry Ten Bombs



These drawings of two secret attack planes of all-metal construction now being built for the government are based on reliable information. No photographs are obtainable. If these flying tanks pass tests successfully, the Army will likely place a large order for them.

now. It developed from "ground strafing." Planes flying low over enemy troops found that they were rarely hit and they were able to drop their bombs from low altitudes with uncanny accuracy.

Attack, bombardment, observation, and pursuit are the four main types of planes used in modern warfare. Attack and observation planes are much the same as far as construction goes; each is a two-place ship with pilot and observer, carrying machine guns shooting forward through the propeller, and another gun or two at the rear to defend the tail. Observation planes usually fly alone in time of war, being protected by pursuit planes if necessary. The purpose of an observation plane is to make photographs, report on the position of enemy artillery, and otherwise act as the eyes of the army.

Bombing planes are twin-motored, comparatively slow, and they fight only defensively. Pursuit planes flying above them act as an escort. Pursuit ships are single-seated, fast fighting units ready to fight at the drop of a hat. There are also transport planes for the carrying of troops. These are usually trimotored ships of large passenger capacity

(Continued on page 192)

Cards Now Played like Midget Golf

THE latest addition to the ever increasing list of games devised for the amusement of incurable golf fans is a combination of midget golf and bridge, played on a carpet spread out at the bathing beach for games between plunges.

The unique carpet on which the game is played has painted on it a circle containing card symbols on which various card numbers are inscribed. In the center is a cup, and the objective of the player is to score by driving the ball into it. If he misses, the ball rolls onto a section representing another card.

The carpet can easily be rolled out on the beach for a rubber at any time.

New combination card-midget golf game, played on beach carpet.

Future Dirigible Without Hangar

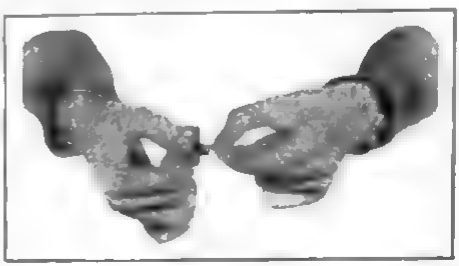
This artist's sketch shows the "dirigible of the future," designed by an eminent Russian inventor. Covered with corrugated sheet iron it will be durable enough to eliminate need for hangar.

A GIGANTIC dirigible which would have an all metal body made of corrugated sheet steel, and which would be so durable as to eliminate the need of the customary hangar, is the novel craft recently designed by an eminent Russian inventor, Konstantin Ziolkowski. This craft will expand or contract according to the interior gas pressure.

Tiny Sharpener for Razor Blades

FOR putting an edge on a razor blade there is now on the market a tiny sharpener which has jaws through which the blade is drawn as illustrated in the photograph. The jaws are made of hard, smooth steel, and will sharpen any standard type of blade with a minimum of time and effort.

The chief advantage of this unique sharpener is that it occupies but little space in the medicine cabinet or the traveling man's shaving kit. All the effort necessary is a few shakes of the hand and, lo! the blade is as good as new again. The blade is drawn through the jaws with the thumb and forefinger as illustrated below.



Tiny sharpener whets razor blades as shown here.

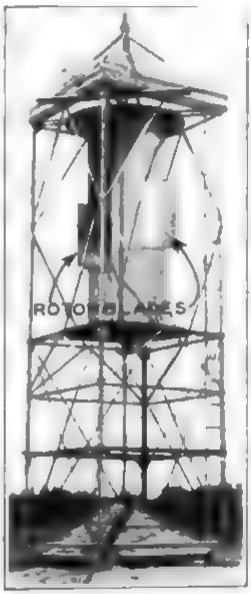
Leather Covered Springs Give Greatest Chair Comfort

Leather covered springs form the back and seat of this extremely comfortable chair, designed by a Stockholm architect for the British monarchs.

THE utmost in comfort is provided by a new chair recently designed by a Stockholm architect for use by King George and Queen Mary, monarchs of England. This unique chair, shown in the photo at the left, has, instead of the customary hard back and seat, a row of leather covered springs which give to fit the curvature of the body. The chairs were on display at the Swedish exhibition in London.

Fletner S-Rotor Used for Windmill

TAKING a hint from the unique power plant of the rotor ship designed by Anton Fletner several years ago, Charles L. Lawrence, aeronautical engineer, has designed a windmill—the only one of its kind in this country — which uses the famous S-Rotor to catch the wind. Mounted high on a platform as shown in the accompanying photo, the cylindrical rotor is hooked to a pump which supplies water to a duck pond. Pump is housed in the shed beneath.



This novel windmill uses famous Fletner S-Rotor to operate the water pump.

Utmost Economy Afforded by Three-Wheeled Car Marketed by British

TO MEET the demand of motorists who want first-class performance with economy of running costs in small cars, an English manufacturing concern has developed a new three wheel front drive small car carrying four passengers. Powered by a 9 h.p. engine, the car will develop 35 miles per hour on the open road and accelerates with astonishing vigor. The car has the customary three forward speeds and reverse, with three-wheel brakes that are smooth, progressive and very powerful. Wheels are easily and quickly detached for repair jobs. A top can be drawn over seats in inclement weather.

The new economical three-wheeled small car developed by British manufacturers. Powered by 9 h.p. motor, the auto develops 35 m.p.h. and has the customary three forward speeds and reverse. Small gas consumption is the car's chief feature.

Novel "Driver-Seat Shop" for Motorists' Convenience

SOMETHING distinctly new in the way of ideas for merchandising automotive equipment is represented in the "Driver-seat Shop," a steel and glass display cabinet that can be placed in all filling stations for the convenience of motorists who wish to make purchases without alighting from their cars.

The top of the cabinet is a glass display case carrying necessary equipment and accessories. Reserve stock is contained in lower part of the cabinet so that the display will not be disturbed when a sale is made. An illuminated sign on top calls attention of motorists to the handy shop.

New "Driver-seat Shop" permits motorists to purchase automotive equipment and accessories without alighting from car.

New Home Health Ventilator Purifies Air and Shuts Out Street Noises

New ventilator which filters air, shuts out noise. Paper filters are arranged in acoustic pockets.

THE cause of health in the home is furthered greatly by the invention of a new ventilator which both filters the air and shuts out nerve wracking noises from the street. With this new device no electric fans are needed; the user enjoys a gentle breeze silently delivered by a smooth running electric motor contained in the ventilator.

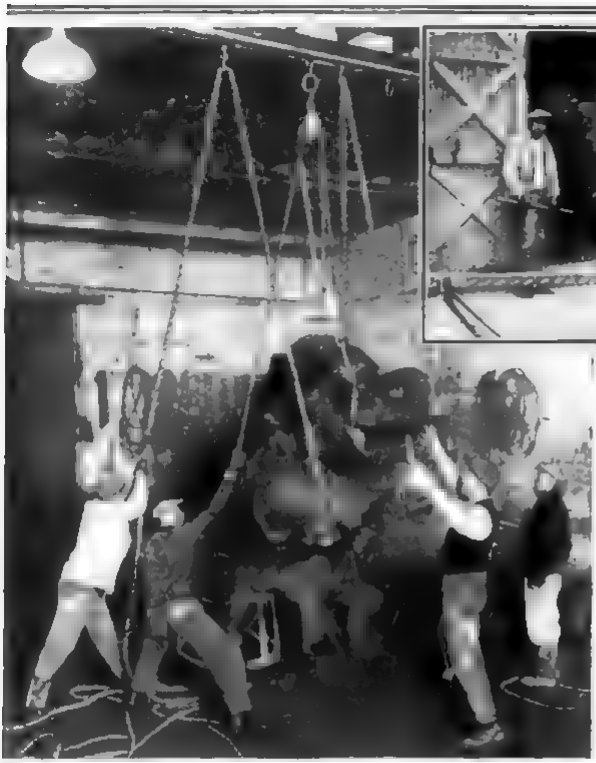
By scientific arrangement and construction of air chambers, pockets are provided for specially treated removable filter papers which strain out all dirt, flies, mosquitoes, etc. The ventilator is installed so that the bottom sash of the window rests full length on the air intake, which draws in air at the rate of 150 cubic feet per minute, enough for five persons in an average sized room. Cleaning costs are lowered considerably.

Fruit Preserved by 'Quick Freezing'

RIPE tasty fruit may be available all the year around since the development of a new method of preserving fruit known as "quick freezing." This new process consists in the rapid freezing of fruit whereby microscopic ice crystals are formed within the cell walls of the article which in no way injure or break down the fibrous tissue. Meat, fish, and other edibles can also be preserved by this method.

This new method of preserving fruit promises to open a new era in the marketing of fresh vegetables and other perishable foods. Canned goods may go by the board when the "quick freezing" process becomes popular.

How Circus Elephants



Block and tackle are used in training elephants to stand on their hind legs. They are hoisted in position when the command word is spoken, and they learn what is expected of them in a surprisingly short time. Gardner is at extreme right.

When elephants "walk the rope" they use narrow steel beams instead of hemp. Note the elephant in the barn door, whose presence is necessary to prevent the young rope-walker from becoming hysterical.

WHEN you go to the circus this summer and watch the elephants walk the tight rope, do shimmy dances, balance themselves on tiny stools, and perform all manner of stunts seemingly impossible for animals of their bulk, give a thought to the hours of careful training which have been devoted to making these huge pachyderms polished circus performers.

For all their vast bulk and seeming awkwardness, an elephant is a gentle, willing, easily-taught creature. You may take "Cheerful" Gardner's word for it. He has been training elephants for thirty-odd years, and today, as chief bull man for the Hagenbeck-Wallace circus, his expert knowledge is often sought by zoos and other circuses. Once made aware of a trainer's desire, elephants cheerfully obey the command, and when left to themselves will often go through their whole repertoire for sheer self-amusement!

Training elephants is naturally considerably different from training dogs or smaller animals. Mechanical contraptions such as block and tackle have to be used on account of the elephant's bulk. For instance, one of the first things a young elephant is taught is to sit down and to rear on his hind legs. The youngster is lifted off his feet with a block and tackle and a leather belt and held in the desired position. The command word is spoken in advance, and in a surprisingly short time the elephant learns what is required of him. He also has the advantage of watching his elders go through their stunts, and he readily apes their movements.

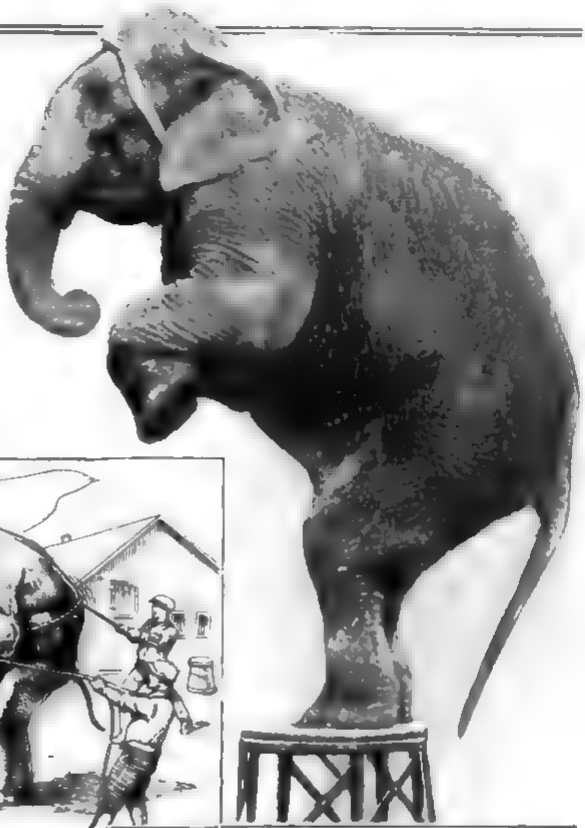
Training usually begins at the age of two or three years. The first step is to teach the youngster his name. Next, he must "tail" or walk along holding the tail of the elephant ahead of him. This simple stunt is of vast importance while among crowds.

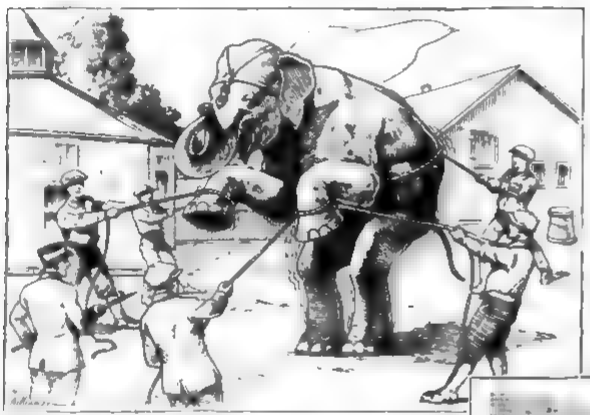
Certain finesse is required in the teaching of special stunts. If you've seen an elephant

are TRAINED

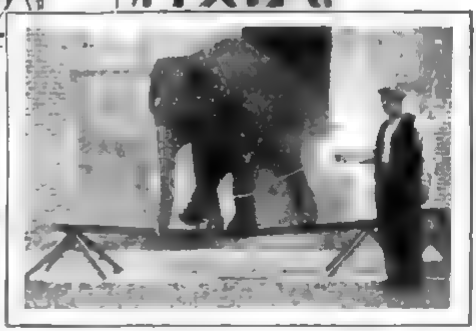
by **M. W. MEIER**
Who wintered with the circus at Peru, Indiana, headquarters.

How do they train elephants to walk a tight rope and stand on two legs? Mr. Meier, intimately associated with the circus business, tells you all about the tricks of the trade in this fascinating elephant story, and incidentally disproves some favorite legends such as an elephant's ability to remember an injury for many years.





Ropes loosely knotted around an elephant's body and gently see-sawed from side to side by attendants teach the huge performer to execute a shimmy dance. Elephants frequently go through their stunts when alone just to amuse themselves.



The steel beam which this elephant is walking is first placed on the ground, and gradually raised.

walk a tight rope, know that he was first taught to walk along it as it was spread flat on the ground. Gradually it was raised from the floor an inch or two at a time. This trick is not very difficult as the great beasts have a profound sense of equilibrium.

The "tight rope" is in reality a steel plank of narrow width, painted to simulate a coiled rope.

One of Cheerful Gardner's most interesting stunts is to make Lizzie, boss of the herd, do a violent shimmy dance to the blare of a band. Knotted ropes, loosely looped around her body and see-sawed from side to side by attendants, taught her this in record time and today, it is her proudest accomplishment.

Cheerful's most dangerous trick is to stick his head into an elephant's mouth and allow

Elephants develop genuine affection for their trainers, and even display symptoms of jealousy on occasion, so naturally the animal shown above is only too careful not to sit down too hard on her fellow-performer in this seemingly dangerous stunt.

Elephants' nails must be filed every two months and all corns removed. Note the scraper used in giving the pedicure. No dainty nail files here!

himself to be lifted into the air by the teeth. A contemporary trainer recently tried it and is convalescing from a fractured skull in a Georgia hospital.

Circuses rarely bother to raise their own stock. Elephants take parenthood too seriously and for years, both male and female are overly devoted to their offspring and spend no end of time trying to educate them. So, it has proven cheaper to import young stock whenever required.

It is the Indian elephant which is chosen for zoos and circus work. The African species is too wild and treacherous to ever stand thorough training.

Acclimation is the first problem of an imported beast. The port of entry must be carefully chosen according to the season of the year. Accustomed to tropical heat, the new arrival must be taught to get along at 80 or so degrees. During inclement weather on the road, the elephant must be provided with blankets and often such things as overshoes. Frozen feet and ears have often happened. During winter months he must have steam-heat and plenty of it.

Food is an all-important problem. Used to such tropical foods as bamboo shoots and rice, the newcomer must be switched to hay, corn, oats, bran and alfalfa. Oddly enough, he must even be taught to like peanuts! To be able to feed an elephant a sack of goobers is the natural heritage of every small boy and girl, but the taste must be taught, for peanuts are not a natural food.

Of all the tidbits in the world, an elephant probably prefers a watermelon to anything. Try it the next time you visit a circus. Take lots of them or you may get mobbed. A full-grown elephant requires about forty

Despite Seeming Awkwardness, Elephants Have Strong Sense of Balance

Training of young elephants usually begins at the age of 10 years. This youngster is going through a stunt which would be impossible if elephants did not possess a remarkable sense of equilibrium and plenty of patience.

gallons of water and some hundred pounds of food per day. The first cost is far from the last one!

Tricks, however, are not all that an elephant must be taught. Around a circus lot, one is more useful than tractors, motor trucks and dozens of men. It is the elephant herd which rears the heavy tent poles, works the big block and tackle and drags the wagons around. A full-grown animal can lift a thousand pounds in his trunk. His tonnage "push" has never been fully measured. Things "give" when he applies his tremendous forehead.

Elephants are always worked from the *left* side, and are forcibly taught to sleep on the left side to conserve space in railway cars and to facilitate handling.

Most of us are familiar with the old saw of comparison—"a memory like an elephant." According to Cheerful Gardner, having an elephant-like memory is nothing to brag about. An absence of six months from any he has ever trained convinced him he had been completely forgotten! As with other wild animals, elephants must follow a daily program of activity to remember what is required of them.

Gregarious as humans in their herd-like tendencies, elephants always recognize one of their number as "boss" and this leader's actions are readily followed. The position is gained by sheer dominance and circus men never interfere when a fight is going on for supremacy. Either sex may hold this position, for a female is always on par with the male, albeit nature gave her somewhat shorter tusks. Tusks, incidentally, are always removed from quarrelsome individuals. If the nerve is too sensitive for removal the tusk is capped with a ball.

An elephant can bring his foot down upon an egg so gently that the shell will not be crushed. Therefore the lad in the above photograph isn't in any imminent peril—a good time is being had by all.

An elephant has many human similarities. He lives to approximately the same age. From fifty on, however, their usefulness rapidly wanes. Blindness overtakes them and their limbs totter. Heart trouble is a fre-

A young bull captured after running wild in the interior of British Columbia for two months, following the stampede recounted below.

Another of the herd of 14 elephants recaptured in the Canadian wilderness. Snares were used in this strangest of all elephant hunts, directed by Cheerful Gardner, who captured every wanderer.

quent cause of death while pneumonia and rheumatism make fearful havoc in their ranks. Always they must be guarded from chills, dampness and indigestion.

Lice often infest them and their thick, cork-like hides to the contrary, mosquitoes and gnats are horrible pests. They always sleep with their trunk-opening closed to prevent insects from crawling in. Certain elephants which have turned killers in the past, were discovered to have had a cancerous brain growth. For this reason, they are always killed when manifesting a violent disposition.

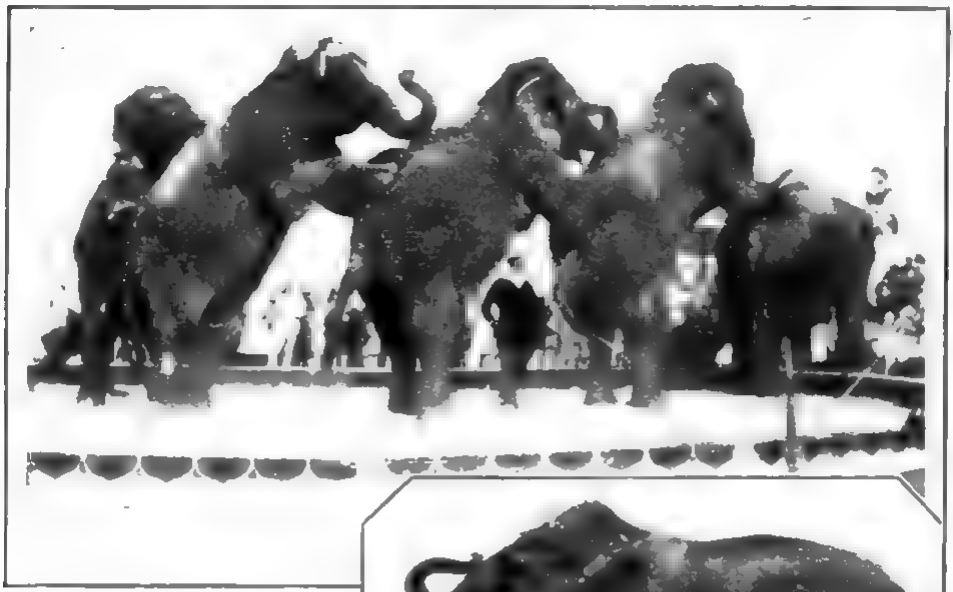
The feet of an elephant require constant care. The nails must be filed every two months and all corns carefully removed. On each side of every elephant's head is about an inch-wide opening to important glands. These openings must be kept religiously clean. In their natural state, an elephant does this for himself with jets of water from his trunk.

A trainer's chief worry is to safeguard his charges from sudden shocks and fears. They are extremely nervous and subject to panic and hysteria. A shrill whistle, a fluttering bird or a snippy fox terrier is ever apt to send them into mad rout.

It was some such simple thing which threw 14 Sells-Floto elephants into a panic at Cranbrook, British Columbia, several years ago. The whole herd took to the foothills of the Rocky Mountains, leaving a sorry trail of ruin in their wake. Their own trainers found themselves helpless to cope with the situation and the circus hastily wired the rival Hagenbeck-Wallace outfit for the loan of Cheerful Gardner.

He was in Kansas at the time and made the 2200-mile journey by airplane. It took him a full month and the assistance of scores of Indian trackers to round up the herd. Some had climbed high among the peaks and others were helplessly lost amidst primeval forests. It was probably the most thrilling hunt ever staged on this continent. Gardner recovered every beast, although one soon died from exposure to a snowstorm.

"Elephants are the smartest and most lovable animals on earth," Cheerful Gardner contends, "and the leading attraction at any zoo or circus. Heaps of people are deathly afraid of them, but that's sheerly because they don't know their real nature. An elephant is as affectionate as a dog to any one he likes and equally as faithful. He even



Despite his bulk, an elephant is a gentle, easily-taught creature who enjoys going through his tricks in the sawdust circle. If you want to make an elephant happy, feed him a watermelon instead of a sack of peanuts.

Cheerful Gardner's most dangerous stunt, permitting an elephant to lift him off the ground with his head in her mouth. One time the elephant sneezed and damaged Gardner's ears.

grows attached to other animals kept near him and mopes when separated. In more than thirty years of contact I've never been injured in the slightest way by one of them."

After maturity (30 to 35 years) a male elephant has a yearly "rutting" season not unlike a male deer. During this period, which often lasts for three months, he must be returned to his permanent quarters and kept securely chained, for he is a menace to everyone, including his trainers, at this time. He cannot be handled or shown on the road. Careful records are kept so that the trainers will be warned sufficiently far in advance to make their charges safe prisoners as this danger period approaches.

A circus regards its elephants as its chief attraction, yet they are at the same time its chief public liability because of their temperament and hair-trigger ways. Children and grown-ups alike give their allegiance to the elephant as the most interesting animal of the circus menagerie. Tigers and lions have a dangerous look; hyenas have repellent personalities, and a hippopotamus seems impractical. But everybody loves an elephant!

Thrilling episodes with elephants are few and far between for Cheerful Gardner, who finds his work as humdrum and commonplace as most of us who work in offices.

"Tailing," as illustrated above, is one of the first and most important tricks elephants are taught.

The THREE DECK CITY

A typical metropolitan three-level business district as planned by Harvey Wiley Corbett, famous New York architect quoted in this article.

THE three-deck street is coming. Our sons and daughters living in the great cities of tomorrow will have become accustomed to three levels. If they go to the heart of the city on rail they will be on one level. If they take their motors they will speed along on a street level designed exclusively for wheeled vehicles, and if they seek to walk about the heart of the metropolis then they will confine themselves to the foot level.

The Regional Committee of New York City has considered such a plan for the relief of congestion. Noted architects have drawn plans to show how such a city would look. Harvey Wiley Corbett is probably the most outspoken in its favor.

"First," he says, "divide traffic into the three natural divisions into which we long ago began its segregation—rail, wheel, and foot.

"Since we have already put much of our rail traffic underground in our large cities, let us elevate the sidewalk to the existing second story level and leave the street level wholly to wheel traffic.

Traffic lights will not be needed in cities of the future, for intersecting traffic will run beneath the main arteries and pedestrians will pass overhead.

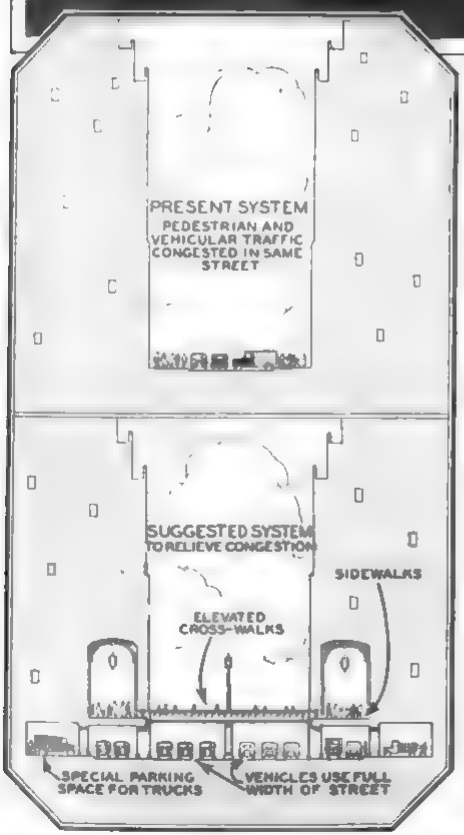
"The sidewalk would then be carried on a strut a few feet away from the building line, cantilevering under the building to carry the load, and being supported so as to permit steps up or down.

"This would increase the capacity of any thoroughfare, say two hundred per cent even when we did not have the third level for rail traffic underground. Our present sidewalk

is COMING

by UTHAI VINCENT WILCOX

Vehicular subways for express traffic and loading and parking space under the building line are indicated in the above drawing of a future city.



These two drawings compare the present and future traffic systems, and show how little change is needed to relieve congestion under this plan.

system is archaic. It originated in a day when none could have foretold the throngs which now stop at street intersections to wait the passing of automobiles or dodge their way through and between them.

"Under this arrangement streets would be bridged at the sidewalk level and foot traffic never become mixed with wheel traffic. Shops and stores and entrances to buildings would be placed at the level of the elevated sidewalk. This leaves wheel traffic where it already is, on the surface of the earth. Thus its level doesn't have to be dug out or built up."

The triple deck street, architects say, has the obvious advantage of elasticity. The plan can be tried out with small units at a time and at a minimum of expense. There is no need of cutting new streets and the great expense of burrowing and excavating is eliminated.

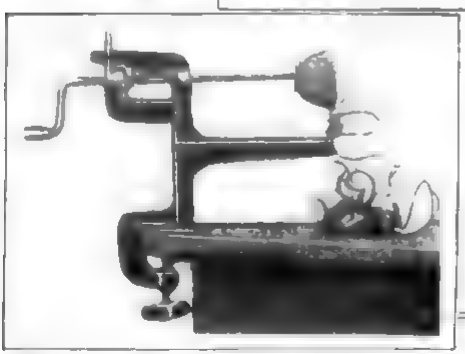
"The greatest advantage in the three level street," Mr. Corbett says, "lies in its ability to permit the uninterrupted development of each kind of street traffic."

Health authorities point out that light and air would be better on the elevated sidewalk level. There wouldn't be so much carbon monoxide. Retail concerns would attract shoppers who wouldn't fear traffic dangers.

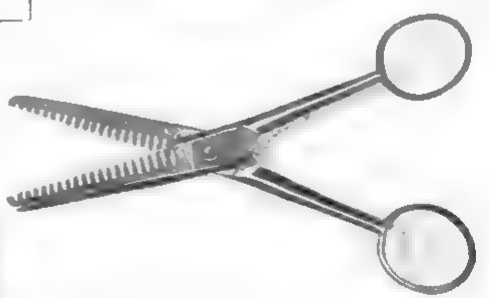
Time and Labor-Saving Aids

The last word in efficiency, economy and convenience is provided by this new ever-ready kitchen range which stores heat in large metal block for use any time of day. The metal block is in direct connection with cooking plates, oven and hot water container. The stove burns coke at rate of seven lbs. every 24 hours and plates covering lids prevent heat from escaping in waste.

Here is an extremely useful kitchen tool that removes tight tops from glass jars or bottles in short order. Equipped with a special fabric strap which slips through a metal loop, the device grips the top and unloosens it with a pull of the handle. The handle is also fitted with two prongs for removing bottle caps.



Fruits, vegetables, etc., are sliced to any thickness the user wishes with the new type vegetable slicer shown above. The vegetable is clutched by prongs and turned by a crank, while a blade cuts uniform slices, saving much time and effort. The device clamps on table as illustrated.



Scissors with teeth resembling those of a comb are now being used by barbers to thin out the hair in producing a new type of feminine coiffure. The cutting edge of the blade is on top of each individual tooth, so that hair falling upon teeth is cut, while hair between teeth is left long. Thus only a part of the hair is cut at a snip.

for the BUSY HOUSEWIFE

Edibles are cooked without water with this new cooker, which has air space to provide correct air-sulation between pot and base.

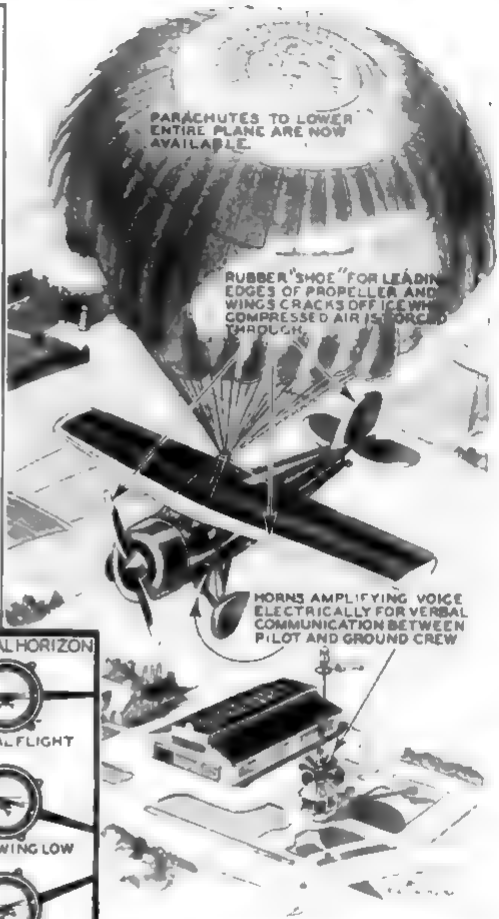
Airplane passengers dining while aloft need not fear that their steak will take a nose dive when the plane hits an air pocket, for this novel tray holds the dishes steady on the table. The device actually holds dishes in place even when in a vertical position as demonstrated.

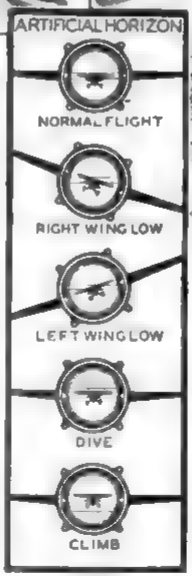
This convenient innovation in card tables is designed to solve the eternal problem of locating cards, pencils, scoring pads, etc. The table is fitted with secret receptacle, opened by a push button, for holding all paraphernalia of bridge party. Light weight, strength are chief features. Legs are folded in the usual manner.

Soiled infants' clothes may be cleaned without the customary unpleasantness by the use of the new brush and board shown in above photo. Water is fed through a hose to the brush, which rinses the cloth spread out over the board.

Rockne PLANE Crash

This new parachute for cabin planes is part of the passenger's chair, so that when danger threatens all he has to do is to jump. The 'chute is comfortable to the wearer.



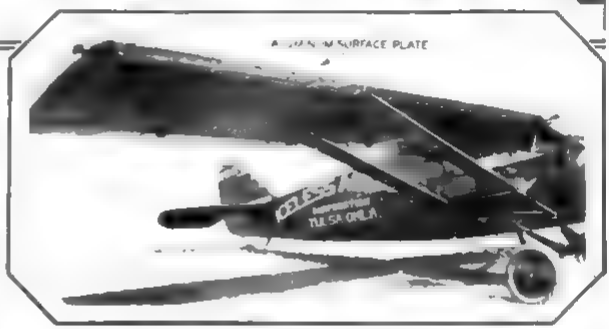


Above are illustrated three new airplane safety devices—a parachute to lower an entire plane, a rubber leading edge for wings which cracks off ice when air is forced under it, and amplifying horns which make the voices of pilot and ground crew audible to each other. At left is shown a new instrument, the artificial horizon, which keeps the pilot informed of the position of his plane relative to the ground, regardless of weather.

FOLLOWING the recent tragic crash of a tri-motored airplane in which Knute Rockne, Notre Dame's famous football coach, and seven others were instantly killed, a new impetus has been given to the invention of safety devices designed to prevent the recurrence of such catastrophes in the future. It will be remembered that one wing of the Rockne plane was torn off in mid-air.

Even at this late date, no one officially knows what caused the Rockne plane crash. One theory is that ice formed on the wings; another, that ice made certain instruments inoperative; still another, that ice forming on a propeller blade and shattered it, with the result that the engine, running wild, wrenched off a wing of the plane. Whatever the cause of the crash, the safety devices illustrated on these pages, every one of which is commercially available to airplane owners, are designed to improve the already excellent rec-

Inspires SAFETY Inventions



Danger of ice forming on the wings is eliminated by this device, described below, which makes use of resistance wires like those used in electric toasters to melt away ice on the wing's leading edge. At right is shown how the outside aluminum plate fits over the heating coils.

ord of flying from a safety standpoint.

Huge parachutes, large enough to lower an entire plane to the ground, are now for sale by at least one manufacturer. The Rockne plane was flying at a height of some 500 feet when it lost its wing. A plane parachute, released at this height, would have been adequate to lower the ship in safety.

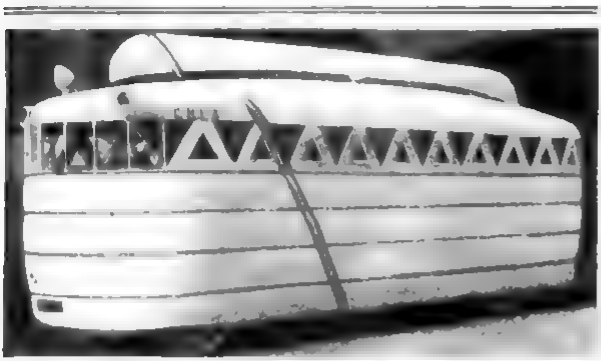
Two methods of doing away with the danger of ice forming on the wings are now available. One, manufactured by the Goodrich rubber company, consists of a thin rubber "glove" placed over the leading edge of wings and tail surfaces, and even of propellers. Underneath this rubber sheet is placed a length of flexible tubing through which air can be forced under pressure. This causes the tubing to expand, moving the rubber glove to such an extent that any ice formed on it is immediately cracked off. Actual tests have proved this device workable.

A second way of fighting ice is illustrated on this page. It is the invention of Archie F. Thompson, and consists of an asbestos base, curved to fit the leading edge of the wing, to which is fastened heating coils of the type used in an electric toaster. Over the coils is placed a surface plate of aluminum alloy. Electric current supplied by a wind-driven generator mounted alongside the fuselage heats the resistance wires and melts any ice which may have formed on the aluminum surface plate.

Super-power horns which amplify the voice to such a degree that verbal communication can be established between an airplane and a ground crew are now available. In case of fog or other emergencies, the value of such equipment is obvious.

One disadvantage of personal parachutes on a cabin plane is that the time required to secure a chute, fasten it, and jump, is likely to be so great that the ship will have crashed before the passenger leaves the cabin. A new type airplane seat in which is incorporated a parachute was introduced at the recent Detroit air show. The passenger sits comfortably on the 'chute pack, and in case of danger has his safety device already attached so all he has to do is jump.

New 'Home on Highway' Has Kitchen, Dinette, Sleeper



This motor caravan, designed especially for vacation tours, has kitchen, dinette, and sleeping accommodations for four people.

MOTOR nomads will find the ideal home of the highway in a new motor caravan which has recently been designed and built by a French engineer for vacation tours. Although somewhat unique in appearance, this odd vehicle, shown in the photo at the left, has a kitchen, dining room and sleeping accommodation for four people. And with all this equipment, which includes also a canoe carried on the roof, the weight of the mobile home is no greater than that of the ordinary automobile seen every day about the streets.

Radios Now Built in Grandfather's Clock, Tuned by Remote Control

RADIO receiving sets have been manufactured in a wide variety of forms since the coming of broadcasting, but the latest and perhaps most unique appearance which a receiver has assumed is that of a grandfather's clock. And because such a type of clock belonged to an age which did not enjoy modern day conveniences, it should not be thought that inconvenience is one of the features of this new radio, for the very opposite is the case. To bring in the stations all the listener has to do is press a button on a tuning dial at the arm of his chair, and lo! the music issues from the solemn looking clock with perfect clarity. The manner of tuning is demonstrated in the accompanying photograph. The tuning dial is hooked to the receiver with a concealed cord.

The modernistic grandfather's clock shown above houses a radio set which is tuned by remote control with push buttons on dial at arm of chair.

Pigeons Now Take Aerial Photos

Strapped to a carrier pigeon's breast, automatic camera takes aerial photos.

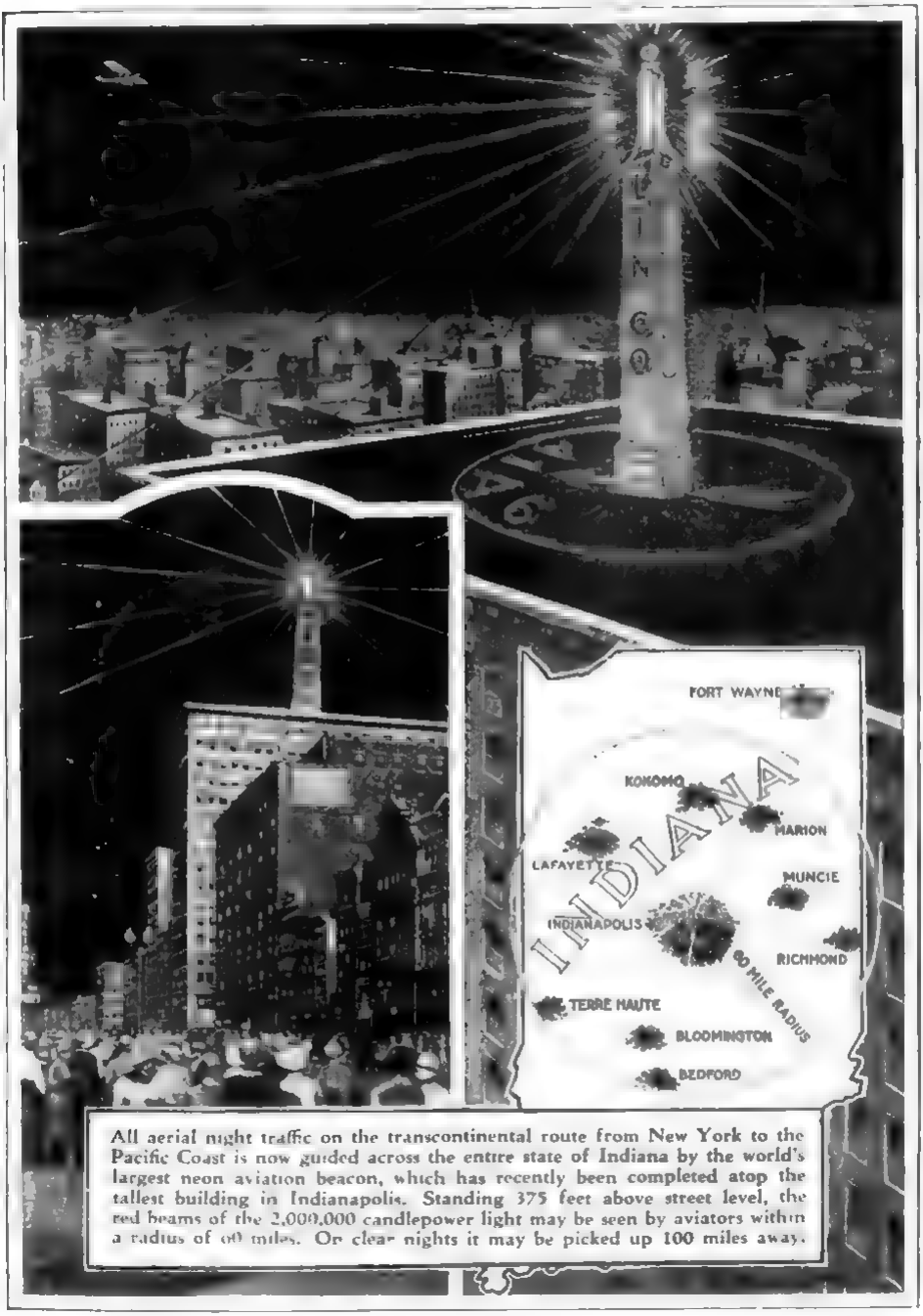
AN automatic miniature camera strapped to the breast of a carrier pigeon is the latest method being employed for the making of aerial photographs in Germany. The camera is timed so that shutter is snapped at regular intervals in bird's flight.

Clothes Pin Makes Blade Handle

A SPRING type clothes pin makes a good handle for an old razor blade to be used as a scraper. The blade is held by a screw through the sides.

Neon Beacon Has 120-Mile Range

Huge Light Is Visible to Aviators Across Entire State of Indiana



All aerial night traffic on the transcontinental route from New York to the Pacific Coast is now guided across the entire state of Indiana by the world's largest neon aviation beacon, which has recently been completed atop the tallest building in Indianapolis. Standing 375 feet above street level, the red beams of the 2,000,000 candlepower light may be seen by aviators within a radius of 60 miles. On clear nights it may be picked up 100 miles away.

Exterminating Rats With Deadly Automobile Exhaust Gas

Officials of Highland Park, Michigan, exterminating rats with carbon monoxide gas from the exhaust of an automobile.

"IF THE fumes from an automobile exhaust can kill humans, they should have the same effect on rats," said the head of the Department of Health of Highland Park, Michigan. And so onto the exhaust pipe of a dilapidated Model T Ford discarded by the police officials, the health officers rigged up a rubber hose and established themselves as modern pied pipers.

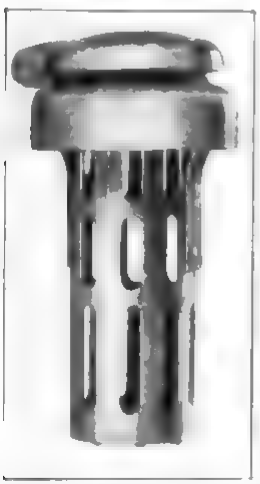
The "hunters" first seal all the holes of the building to be operated upon, leaving just two openings. The hose is then inserted into one of these, the engine of the Ford coaxed to wheeze a bit, and the carbon monoxide does the rest.

Synthetic Rubber and Leather

DOCTOR GEORGE A. BURGESS, director of the Bureau of Standards, recently announced several achievements by American scientists. Among these are rubber from crude petroleum, rubber crystals, leather from pulp mill waste and sugar from cotton-seed hulls.

Formerly rubber has been on the borderline between solid and liquid. Rubber crystals, if fully developed, would mean solid rubber, having qualities hitherto not possessed by that substance. Sulphite cellulose extracts from the waste of pulp mills can be blended with vegetable tanning materials and used to produce heavy leathers.

Can't Steal Gas With This Cap



The locking lugs prevent removal of the cylinder.

WHENEVER you park your car you are running the risk of having your gasoline stolen, and you may be miles from a gas station when your car sputters and stops and you discover your loss.

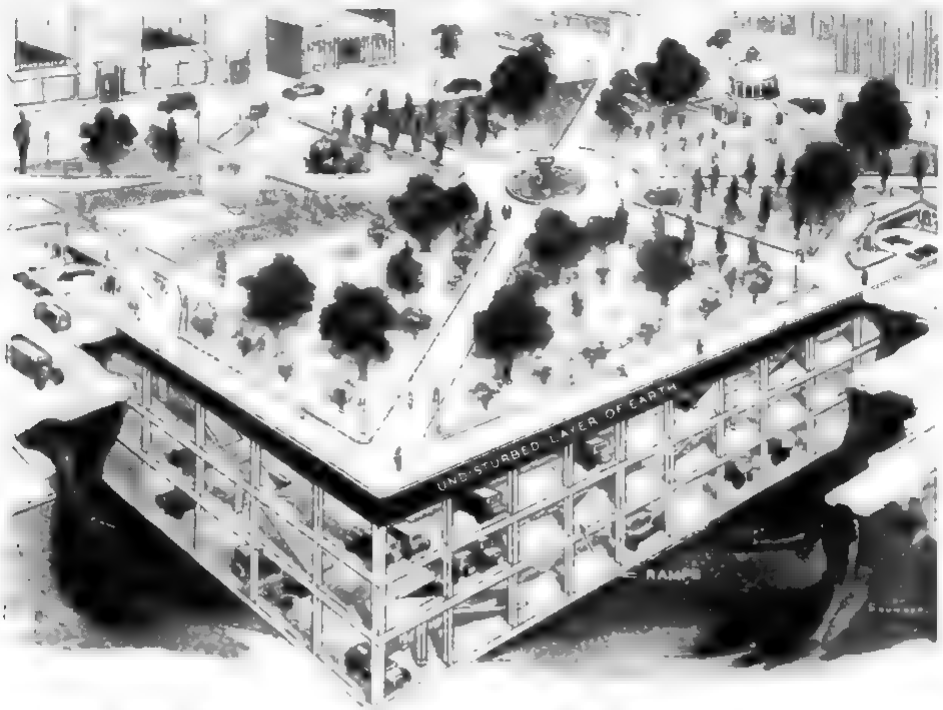
With the cap illustrated here it is impossible for the gasoline thief to syphon a drop of gas from your tank. Neither can the cap be removed or lost.

Just in Case the Bridge Is Out

This boat is 10 feet long, three feet wide, and can carry approximately thirteen times its own weight.

HERE is a 60-pound aluminum rowboat designed by Frank Beer of Los Angeles which is handy to have along in case you want to cross the river or pose for your photograph.

Underground Parking Plants to Solve Congestion Problem



This artist's drawing shows $3,000,000 underground parking plant proposed by Los Angeles engineers.

THE great American parking problem, which is becoming increasingly important as the cities grow more and more crowded, and as automobiles become more and more numerous, will probably find its solution in a novel scheme proposed recently by Los Angeles engineers. This scheme calls for the construction of huge parking plants under areas occupied by parks, playgrounds, and other such places where there is no great weight resting on the earth. The artist's drawing above gives a clear idea of the plant with the ramps leading to the various levels. Cars will enter the plant through a gateway on the street, and drive down the ramp to take an appointed place.

The chief advantage of such a scheme is that, so far as the surface area of the city is concerned, the plant will occupy no space at all. Neither will the underground structure prove in any way unsightly, as is the case with many garages. Los Angeles engineers are planning the construction of one of these garages beneath Pershing square, in that city.

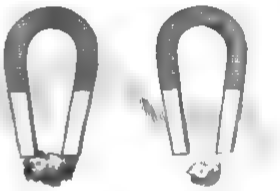
Game of Quoits Puts to Sea

THE game of quoits has put to sea and is being played with floating pegs and rings. The player stands at a distance and tosses the ring over a peg to score points. It's easy to construct these floating pegs to add to the fun at your own bathing beach.

New sea quoits game played with floating pegs.

Earn GOOD WAGES in

Watching gold settle down in a sluice box, which utilizes the current of the stream to perform the work of several gold pans.



Two handy gold tests are shown in these drawings. Iron sands stick to a magnet; gold does not.

Panning sluice box tailings from a power driven "sand sucker" which is merely a small capacity gold dredging outfit. Tailings are shaken in pan.

Gold-bearing sands in western states are yielding wages as high as $8 or $9 a day to amateur gold-panners. Mr. Hogg gives you the how, where, and why of the new gold rush in this article.

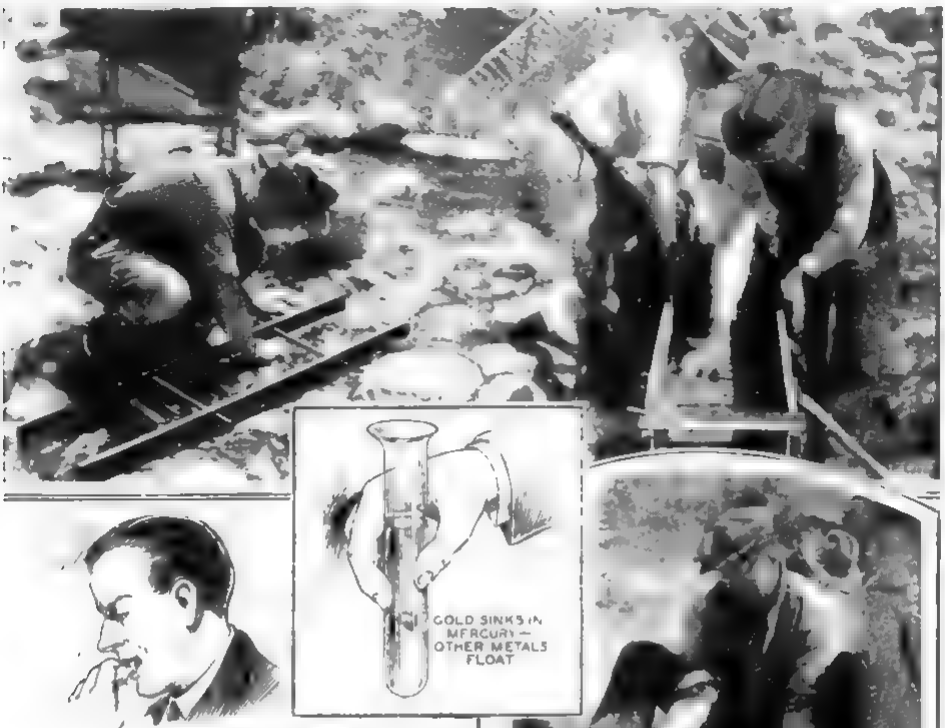
THERE'S a new gold rush on—one in which you can participate as well as the seasoned prospector, with the reasonable assurance of panning out a fair day's wages, and with the ever-present possibility of striking a nugget which may vary anywhere from $50 to $5,000 in value. Hundreds of men, thrown out of work by the business depression, are today panning out gold in the thousands of places where it is known to exist in small quantities. They are making fair wages in a healthful, outdoor occupation, and they're assured a job as long as they are willing to shake a gold pan.

If you are wondering what chance you would have to become a gold panner, let me present the facts and permit you to draw your own conclusions.

Pan gold or placer is usually found in the beds of streams. It occurs in innumerable mountain streams in nearly all of our western states. The big mining syndicates are not interested in this kind of gold unless

New Gold Rush

by JOHN EDWIN HOGG



Gold is malleable, like lead, when bitten between the teeth. Other metals, sometimes mistaken for gold, are crisp and brittle when bitten. Gold sinks in a test tube of mercury; most other metals float.

it is found in what they consider commercial quantities. A location where a single miner working with a gold pan would be able to pan out good wages for an indefinite period wouldn't be of the slightest interest to the big dredging outfits. The big dredging concerns would have to have millions of tons of such gold bearing sands before they could be sure of paying for their costly machinery, and paying dividends to their stockholders over a period of years. So, they have left all the small gold-bearing streams for the "little man" with low overhead expense and primitive methods of removing the pay dirt from the sand.

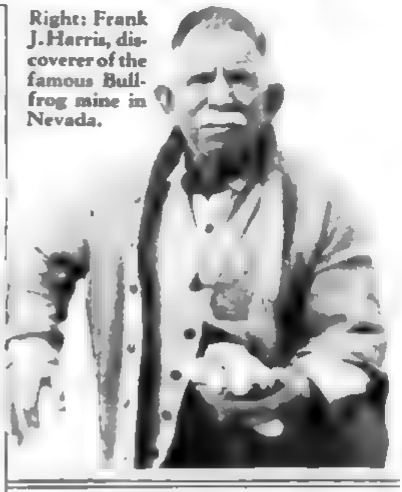
The prospector who goes along such streams examining the sands will usually have his attention attracted to what he thinks

These men, with sluice box and gold pan, are making good wages in a California stream. Gold panning is hard work, but it's healthful and returns are usually good for from $2 to $9 a day.

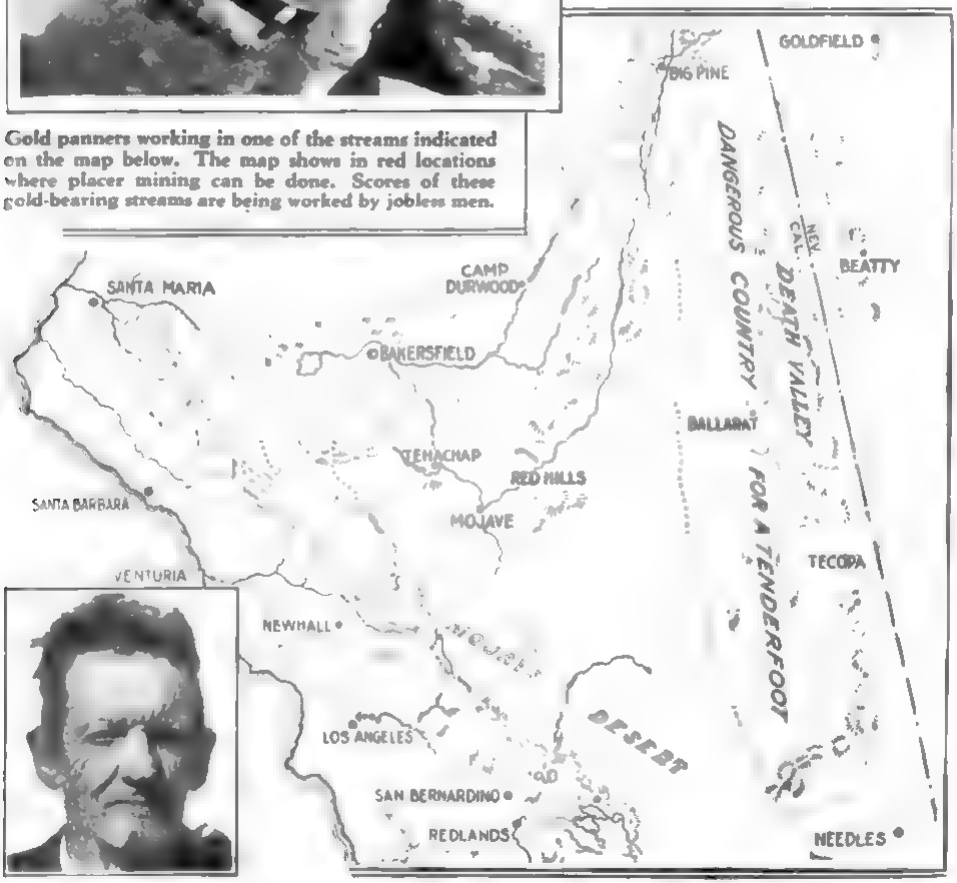
is gold by seeing it sparkle. The yellow sparkle may be gold, or it may be mica, iron or copper pyrites, or numerous other substances having much the appearance of gold. Having found what looks like gold in a stream, the prospector usually makes what is known as "the toothpick test". With the point of a toothpick he reaches under the water and endeavors to pick up one of the

Principal Areas for Gold Pan Prospecting Are Shown on the Map Below

Gold panners working in one of the streams indicated on the map below. The map shows in red locations where placer mining can be done. Scores of these gold-bearing streams are being worked by jobless men.

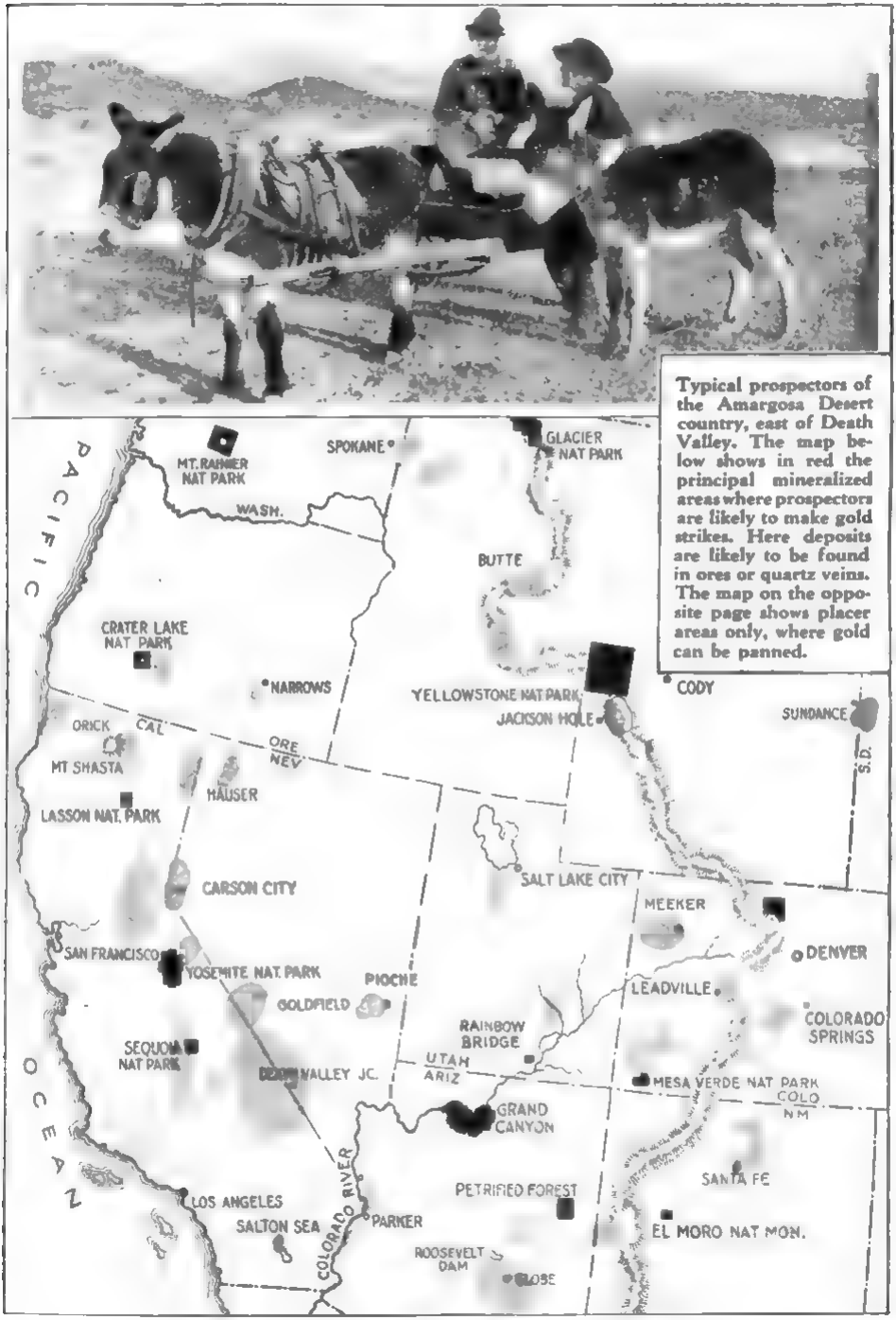


Right: Frank J. Harris, discoverer of the famous Bullfrog mine in Nevada.



Ralph J. Fairbanks, dean of Death Valley prospectors, has made his pile and retired from the trail.

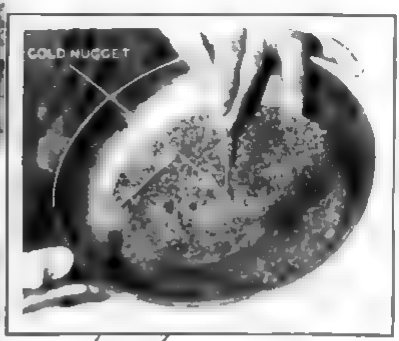
Hard Rock Prospectors May Win Fortunes From Areas Shown Below

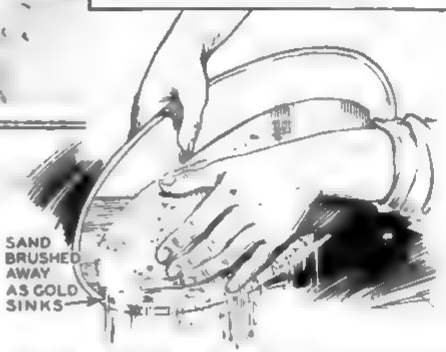


Typical prospectors of the Amargosa Desert country, east of Death Valley. The map below shows in red the principal mineralized areas where prospectors are likely to make gold strikes. Here deposits are likely to be found in ores or quartz veins. The map on the opposite page shows placer areas only, where gold can be panned.

Panning Is Hard Work, But You May Be Repaid by Finding a Nugget

Sunburned necks, ceaseless digging, constant rocking of the gold pan are all part of the miner's job. It's real work for a husky man.





Gold sifts down through the water-covered sands in the pan. Sand is gradually brushed away until only gold remains. Photo of pan at top shows gold nugget recovered by a gold panner.

yellow flakes. If it is mica or iron it will float right away when it is touched with the toothpick. If it is gold it will come right up on the toothpick or work down into the sand.

Another test by which gold dust may be instantly distinguished from iron is to use a magnet. Iron will stick to the magnet. Gold will not. The next test for the yellow particle thought to be gold is the test for malleability. Place the yellow flake on the tongue, then get it between the front teeth, and bite down hard. Gold is malleable, and when you bite it it's exactly like biting down on a flake of lead. It can almost be chewed like chewing gum without going to pieces. Mica, pyrites, or other substances are gritty when bitten. The yellow flake that responds to these tests, is almost certain to be gold. Now examine it with a miner's magnifying glass. If it is gold, the tiniest flake of it will look exactly like a nugget. The final test, however, is reaction to acids and mercury. Gold is immune from the corrosion of nitric and sulphuric acids. Gold will not float in mercury. Anything else will.

Having located gold-bearing sand, the isolation of it in the gold pan is a fairly simple process. The amount of gold in the sand and the willingness of the gold panner to work determines the financial returns. A quart or more of sand is placed in the pan and covered with water. The pan is then rocked gently to and fro. The particles of gold are heavier than anything else in the pan, and will gradually work down out of sight in the sand. When all the yellow particles have disappeared the water and sand on top are carefully brushed out of the pan with the hand. More water is added, and the panning process is continued. Eventually all the sand will be eliminated, and the fruits of the effort will be a streak of color in the bottom of the pan. A magnet is often useful for removing iron sand, which always remains in the pan longer than the lighter particles. The little streak of color that remains in the gold pan is then ready to be laid out and dried. When dry it goes to the treasure bottle as gold dust worth $20.67 per ounce.

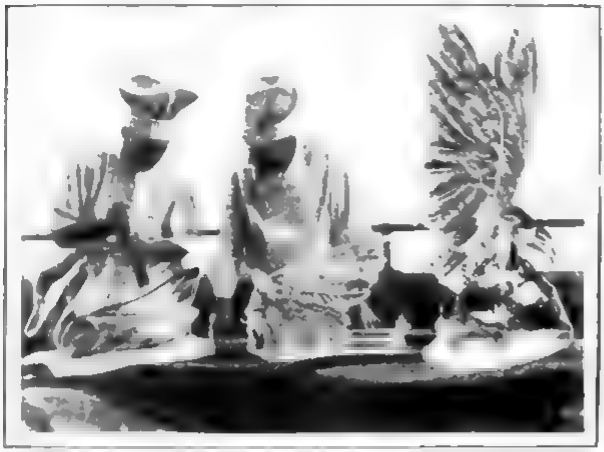
It may take half an hour or more to work the gold out of a single pan of gold-bearing sand, but if the panning yields only a small pinch of pay dust, the effort is well worth while. With gold worth $20.67 an ounce, it takes only one eightieth of an ounce to be 25c worth, and one eightieth of an ounce of

(Continued on page 206)

Exploring Ocean Depths with Television

To enable scientists to make photographs and moving pictures of the strange fantastic life of the ocean depths, a New York engineer has proposed a scheme using a television transmitter enclosed in a strong metal sphere, as illustrated in the artist's drawing above. The powerful light will illuminate the scene, which the apparatus will televise and transmit to the ship on the surface. By watching the image in the television receiver, scientists can observe the undersea scene as if they were on the spot themselves. Salvage and submarine engineers will also find this scheme extremely helpful in their work.

Statues Carved From Ice Are Latest Dinner Decorations



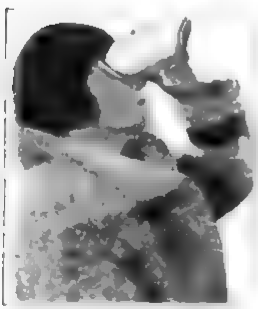
Hotel chefs carve ice statues with chisels. These are used as sparkling decorations on banquet tables—while they last.

USING ice as a medium instead of marble, the chef of a large New York hotel has started a vogue for frozen statuettes to be used as table ornaments at banquets. An ice statue of an eagle with poised wings, mounted in the center of a speaker's table at an aviation dinner, makes a sparkling attraction to catch the eye. Housewives can adapt this idea by making their own ice statues, dressed up with parsley for grass or such other decorations as may be appropriate. Chisels and picks of various sizes are the only tools necessary in this odd art, but considerable skill and practice is required to avoid breaking off large chunks which will destroy the pattern.

Rubber From Sage Brush

COMMERCIAL production of rubber from sage brush is now under way in a southern California plant erected at a cost of $150,000. The product is not synthetic rubber, nor a rubber substitute, but is identical with ordinary rubber. The domesticated form of sage brush from which it is produced is known as guayule, requiring from four to ten years to mature. An initial production of 15,000 pounds of rubber a day is announced by the marketing company. Six thousand acres of land are planted with guayule at the present writing. The guayule plant has long been known to have a rubber milk content.

Eye-Shade for Watching Planes



Cardboard eye-shade for watching planes in flight.

A NOVEL cardboard shield, shaped to fit tightly around the eyes, has recently been devised for watching airplanes, boats and other objects where glaring reflections are hard on the eyes. The inside of the shield is painted black.

Dressing Up Gorilla's Skeleton

DELICATE methods of technique, involving the construction of a plaster body which faithfully follows the outlines of the original figure, are used by modern taxidermists in mounting animals. The skin is stretched over the statue, as shown in the above photograph in which a gigantic gorilla is being mounted.

Auto Fitted With Floats to Navigate Both Land and Water

Capt. Malin demonstrating his amphibian auto supported by floats and driven by paddles on wheels.

DESIGNED to ford streams and rivers on a 12,000 mile jaunt of exploration around the world, a new amphibian automobile has been constructed by Capt. Geoffrey Malin, British explorer, which floats by means of huge inflated bags attached to a special electron frame at the side.

This combination auto and ferry boat is driven by means of paddles attached to the rear wheels, and is so arranged that the water can in no way damage the motor. Before taking to the water the floats are attached to the frame and pumped up, appearing like huge sausages, as shown in the photo above.

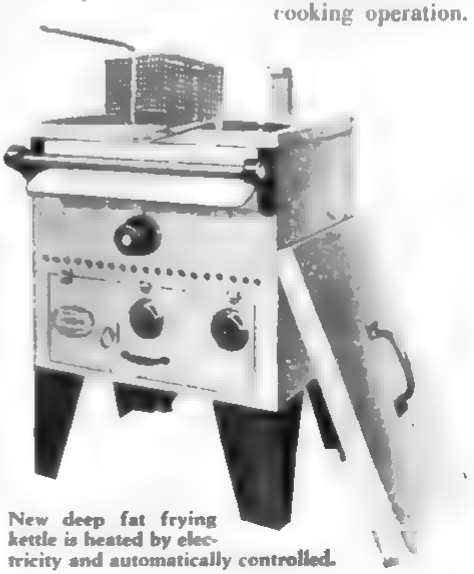
Dim Lights Aid Concert Enjoyment

DIM lighting for concerts, not so much to save light bills as to increase the enjoyment of the music by the audience, is being tried in London. A general principle of human psychology is that of antagonism between the senses, particularly of hearing and seeing, so that any one sense works better and is more delicate if other senses are not stimulated strongly at the same time.

On this basis a concert room, in which it is desirable that the sense of hearing be as accurate as possible and make the deepest impression on the brain, should be dimly lit, with only a soft area of light falling on the musicians. This is the condition with which several London concert halls now are experimenting.

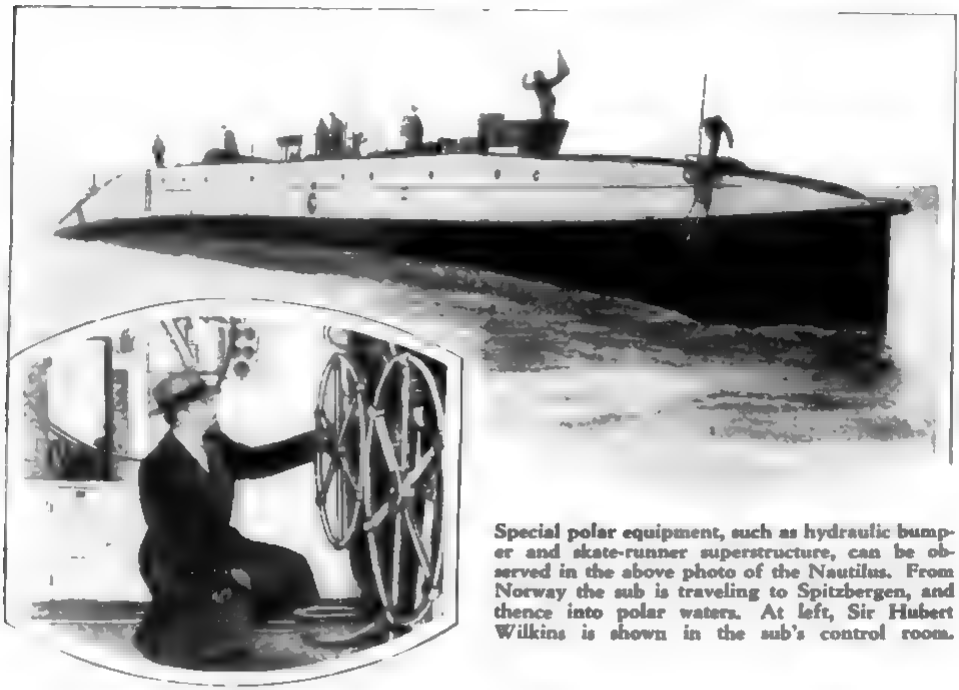
Economical Fat Frying Kettle

FAT for frying can be used over and over again without contaminating any food with the odor or flavor of food previously cooked, by the use of a new electrically heated and automatically controlled deep fat frying kettle now on the market. The new machine prevents overheating, effects a great saving in fat consumption, and adds immensely to the ease and cleanliness of the cooking operation.



New deep fat frying kettle is heated by electricity and automatically controlled.

DIVING Under Ice to



Special polar equipment, such as hydraulic bumper and skate-runner superstructure, can be observed in the above photo of the Nautilus. From Norway the sub is traveling to Spitzbergen, and thence into polar waters. At left, Sir Hubert Wilkins is shown in the sub's control room.

by **LEW HOLT**

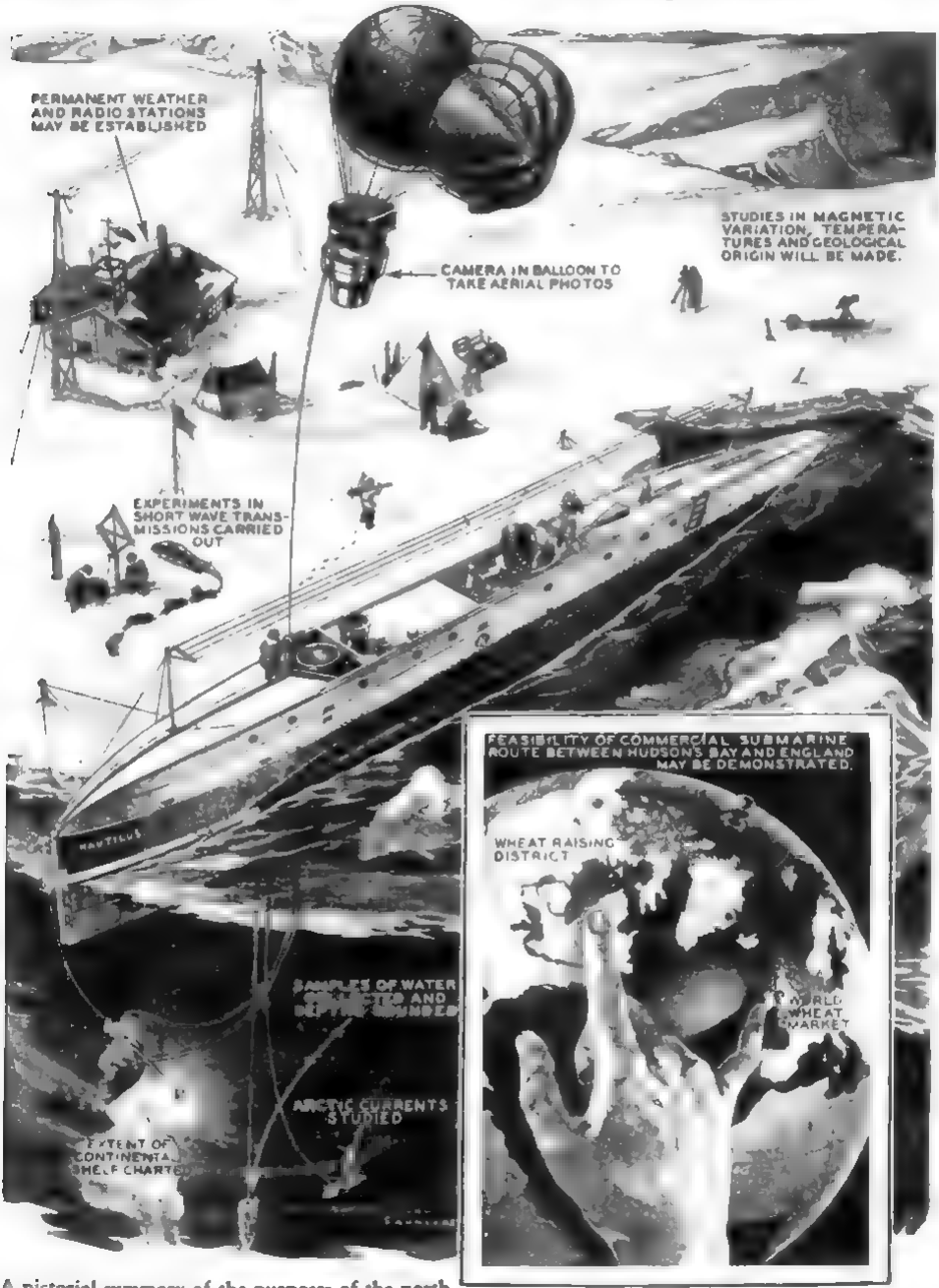
Sir Hubert Wilkins' amazing journey under the North Pole in the submarine Nautilus, now under way, may discover evidence which will solve long-standing polar mysteries. Are there undiscovered islands near the pole—will the expedition discover a fathomless hole at the axis of the earth? Some of the riddles they will answer are described here.

HOW deep is the Polar sea? What is the effect of Arctic ice on the world's weather? Can meteorologists, from a study of conditions at the North Pole, forecast months in advance droughts and hurricanes which will visit the rest of the world? Is there any basis of truth in the beliefs of some scientists that the Arctic basin represents a great hole in the earth left when the moon hurtled out of it ages ago? Will a submarine traveling through Arctic waters emerge gold-plated because of the supposed relatively heavy gold content of northern seas?

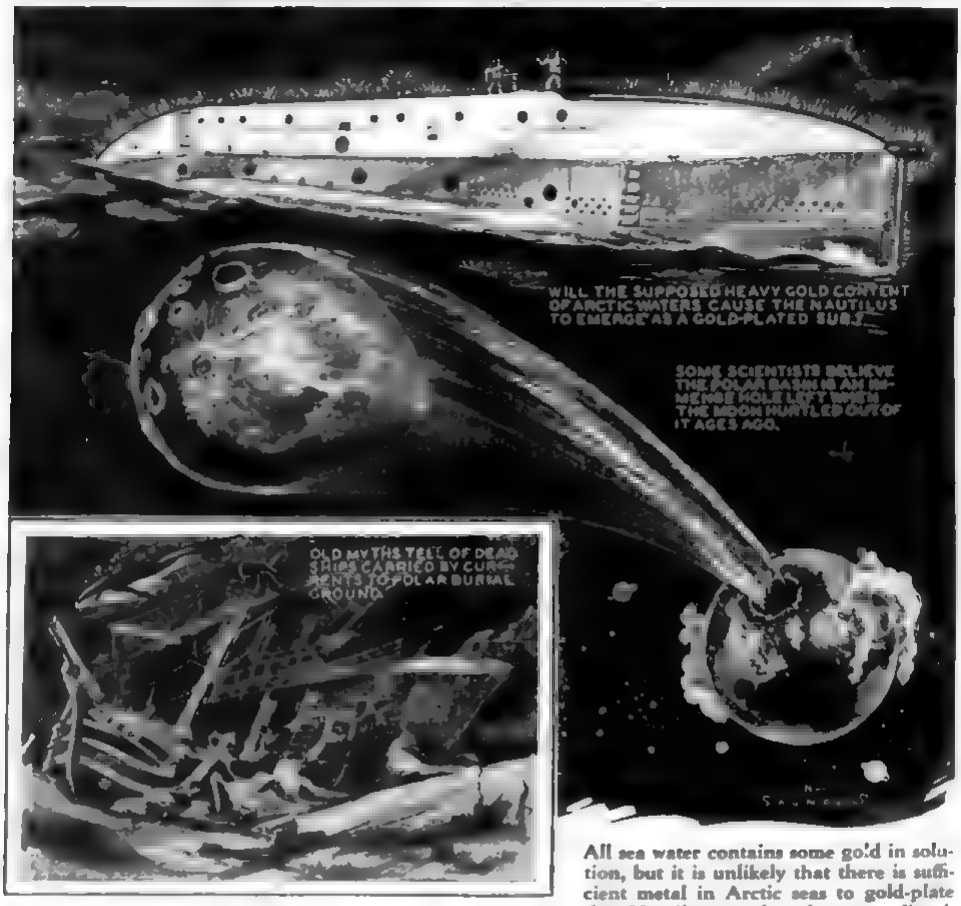
These are a few of the scores of scientific riddles which will be solved by Sir Hubert Wilkins and his crew of the amazing submarine *Nautilus*, which is now traveling toward the Arctic, bent on the startling project of diving under the ice of the North Pole to settle once and for all questions which have puzzled scientists for years. If the mechanical safeguards installed on the *Nautilus*—described in last month's issue of MODERN MECHANICS AND INVENTIONS—are able to carry the submarine safely through the innumerable perils it will encounter on its daring journey through the top of the world, then this expedition, which many men have called foolhardy and doomed to certain destruction, will have justified itself adequately in the eyes of science.

It may seem at first glance that the mys-

Solve Polar Mysteries



A pictorial summary of the purposes of the north pole submarine trip is presented in this comprehensive drawing. Picture of the globe shows how the shortest trade routes lie across the top of the world.



Legendary accounts of a Sargasso Sea of dead ships in polar waters hint at mysterious ocean currents in the arctic.

All sea water contains some gold in solution, but it is unlikely that there is sufficient metal in Arctic seas to gold-plate the Nautilus, as has been predicted. Depth soundings of the Polar basin will determine if the moon once occupied it.

teries locked in Arctic ice can have little practical interest to a world which occupies warmer lands thousands of miles removed from the North Pole. But if, through the establishment of weather stations at various points in the Arctic, meteorologists are able to gather information which will enable them to tell the corn growers of Iowa that they are due to have a hot, dry summer two years hence, or to inform orange growers of California that the season of 1935 will be wet and cold, then the value of the information gathered at the top of the world will have proved itself well-nigh priceless. That is one of the purposes of the Wilkins expedition. It hopes to find spots where permanent weather stations can be established.

It has been calculated that 18,000 cubic miles of drift ice reach the Atlantic ocean yearly from Arctic regions. When you consider that all the people in the world can crowd into a space of one cubic mile, as illustrated elsewhere in this article, you begin to realize the tremendous volume of ice which affects the world's weather. There is even more ice in the Antarctic—so much that sea levels throughout the globe would be raised 30 feet if it were to melt in a day. The movement and distribution of polar ice is not uniform from year to year. Weather stations could report on its distribution and so supply information which, in connection with knowledge already at hand from tem-

Special Diving Chamber on Deck of Nautilus Permits Exit Under Water

Here is a closeup view of the diving chamber illustrated on the cover of this month's magazine. It permits a diver to emerge under water to make repairs to the submarine, or to take under-water photos with a special movie camera, as shown.

perate regions, would make long-distance forecasting a possibility.

There may be islands in the Arctic sea on which permanent stations could be established. If there are, the *Nautilus* is likely to find them. There are thousands of miles of polar wastes which have never been explored. Who can predict what mystery land may be discovered by the expedition? The whole trip is the most amazing voyage of exploration since the days of Columbus. All existing maps may have to be re-drawn when Wilkins returns.

No one has any idea of the contour of the bottom of the Arctic basin. There is even a theory which has gained some credence that there may be a hole through the center of the earth, extending to unfathomable depths. This is not likely, but possible. The fact that the sounding instruments carried to the Pole by Peary were not long enough to strike bottom has given encouragement to believers in this theory. No one can definitely say, now, what the facts are—but when the *Nautilus* returns it will bring with it an accurate chart of the sea bottom. Soundings will be made by the electrical method familiarly known as the "sonometer", in which a sound wave is sent from the submarine to the bottom of the sea and its return echo registered. The time interval consumed makes it easy to compute the distance traveled.

Ice drills in the submarine which can bore through 100 feet of ice enable fresh air to be brought aboard the ship, and makes it possible for observers from the sub to get out on the ice to study polar conditions, even when there is no stretch of open water available for the ship to come to the surface.

A photographic balloon filled with helium will be used to send up a camera to take aerial photos. In case it seems desirable to know the nature of the country before venturing out of the submarine, the camera balloon can be sent up through the conning tower and an air photo snapped. This will show the country for miles around. A compass carried in the balloon will be photographed on the same plate, so that the problem of direction will be solved. In effect, the aerial balloon will produce a made-to-order map in an emergency.

Water-tight movie cameras are also part of the equipment of the *Nautilus*. With them pictures can be taken beneath the ice of the polar sea.

Experiments in short-wave radio broad-

These drawings picture the influence of the Poles on the world's weather. Tremendous masses of ice, drifting from the Poles, have a direct influence on temperatures. During winter months a 5,000,000,000 ton surplus of air collects at the North Pole, shifting southward in the summer, creating winds. Data along these lines will be collected by the Wilkins Expedition.

casting will be conducted at the Pole. It is not known whether the sub can broadcast when submerged, but it will be lying on the surface often enough so that operators in the United States with short-wave receivers should be successful in catching the signals from the North Pole.

What sort of life exists in the Arctic? Walrus and polar bears are about all that occur to the average person. But there is unquestionably a wide variety of sea life, animal and vegetable, existing in minute form in Polar waters. A unique mechanism by which the *Nautilus* can collect samples of such life, and preserve them for reference, has been devised.

A roll of muslin, unfolding something after the fashion of a roll of film, will filter samples of Arctic water through it constantly. Sea life which collects on the muslin will be preserved as the roll is wound up. Later on, when the sub returns to civilization, it will be a simple matter to unroll the precious muslin and make an exhaustive study of the sea life adhering to it. No one can predict what odd forms of life will be discovered.

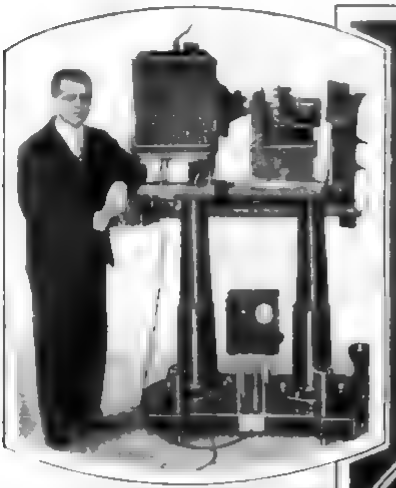
Even the bottom of the sea will yield up its secrets. Hollow tubes will be lowered from the submarine, collecting deposits of ooze which will give geologists an insight into the physical construction of the northern hemisphere. Evidence thus collected may serve to disprove or substantiate current theories as to the origin of the world. Perhaps, ages ago, there was land at the Pole where now is only water. Perhaps the temperature was warmer, the land occupied by a long vanished race. If so, the sample-collecting tubes of the *Nautilus* will probably supply the evidence.

Magnetism, that odd force which operates compasses, will likewise be studied. Probably the *Nautilus* will float directly over the magnetic pole. If she does, her compass needles will likely point vertically instead of to the north.

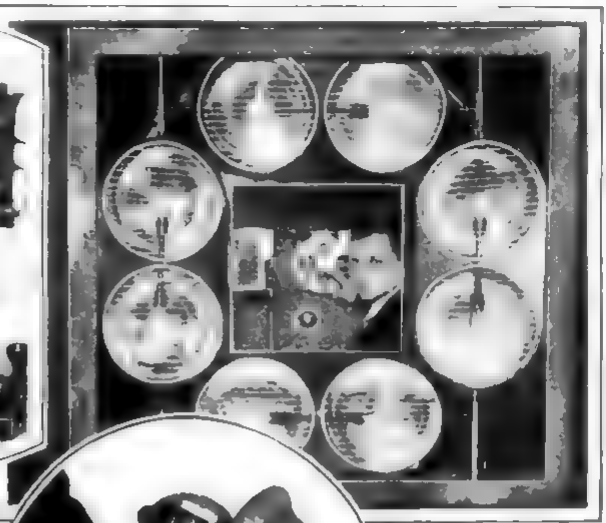
What about currents in the Arctic ocean? It is roughly known that there is a current flowing from the Bering Sea towards Spitzbergen, but there is very little real knowledge on the subject. Many problems of economic importance can be hastened toward solution when scientists know more about Arctic currents. For instance, it is possible that the great Hudson Bay country in Canada can be opened up by connecting it with England

(Continued on page 190)

Television Shows Full Size Images



U. A. Sanabria and his television projector which throws clear image on ten-foot screen, shown below.



Mr. Sanabria at the lens turret of his television camera, which takes pictures through opening surrounded with photo cells that pick up image. Left—The Taylor neon arc lamp that makes possible the full size television images.

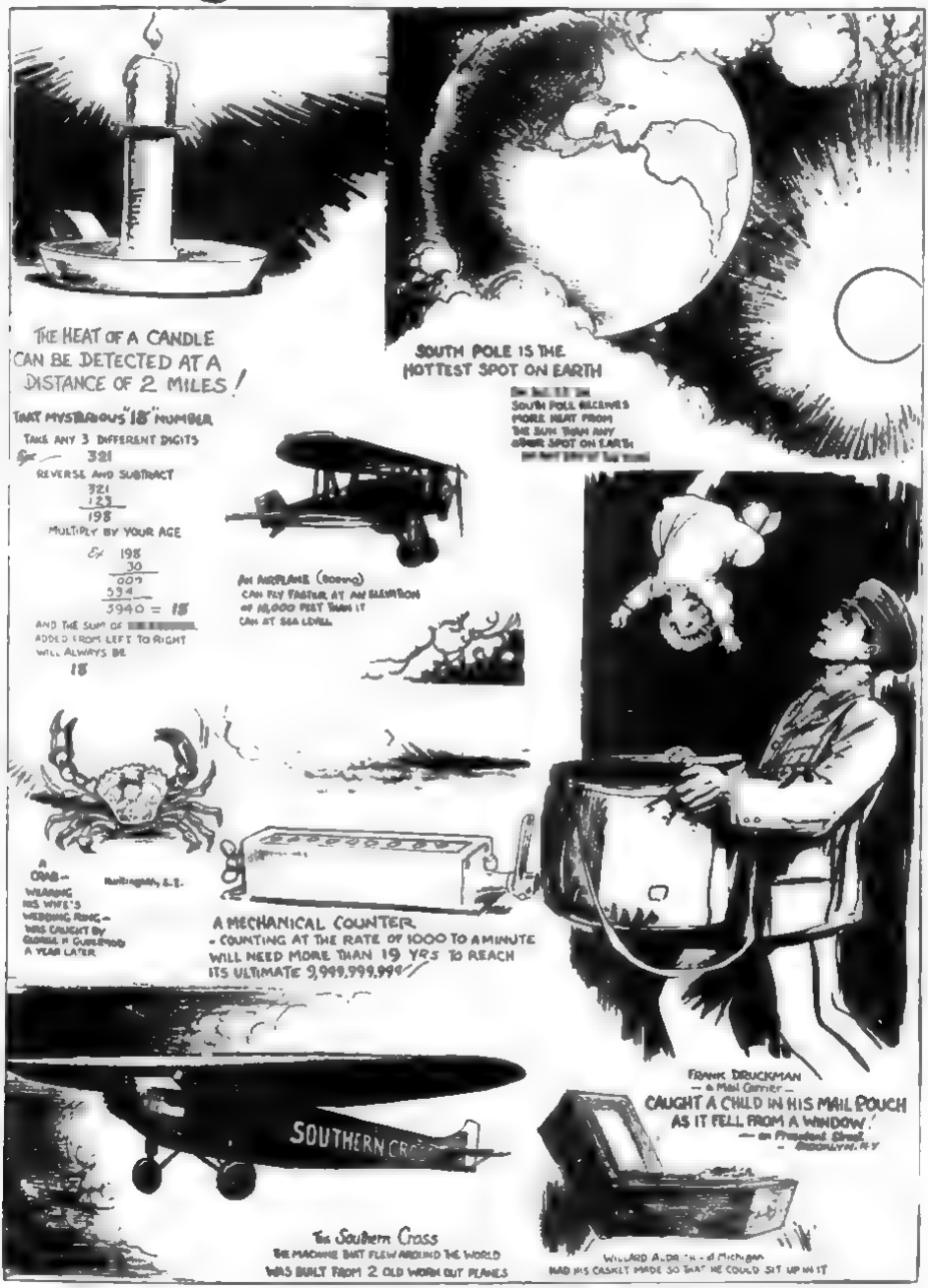
MOVING television images on a screen 10 feet square, produced beautifully clear, perfectly defined, and possessing the illusion of depth, is the latest and most amazing step in the advance of television art. This new development, accomplished by Mr. U. A. Sanabria, a Chicago television expert, enables a large crowd of spectators to view a radio performance, and heralds the day of "television theatres." Full size images are made possible chiefly by development of a new neon arc tube and a special scanning disk.

BELIEVE IT or NOT!

Anyone doubting the truth of these statements may obtain proof by writing to Robert L. Ripley, in care

by RIPLEY

Freaks of the Mechanical World That Challenge Belief



of Modern Mechanics and Inventions, 529 S. 7th St., Minneapolis, enclosing a stamped envelope.

MOTORCAMPING for

A motor camp in the Sequoia National Forest, one of many of the beautiful Rocky Mountain camp sites.

by DICK COLE

Now is the time of the year when the open road beckons, so let's load up the car and trailer and become gypsies for a week or two. This article, written by a confirmed motor nomad, tells what equipment you will need and how to avoid the pitfalls which beset the novice.

CAMPING out is not "roughing it"—not necessarily. Nowadays camping usually means motorcamping; the family car transports a complete portable home wherever fancy wills. Indeed, motorcamping has become a national summer sport. Very cosmopolitan, too. Rickety flivvers, laden with a miscellaneous assortment of pots and pans, chug along in noisy travail, brushing fenders with shiny Lincolns, fitted with elaborate tourist's trunks, and gliding along in silent grandeur.

Thanks to the acceptance by many of the thinly populated western states of federal aid in road construction, many heretofore inaccessible historical landmarks and beauty spots are now readily accessible to the motorcamper. One can now penetrate the Navajo Reservation and study the Indians in all of their primitive crudeness; can invade the country perpetuated in the novels of Zane Grey; can travel and camp in comfort in Death Valley.

The manner of motorcamping is very diversified. The main highways abound with auto camps, where camping space can be rented, and sanitary and cooking facilities are provided. The true motorcamper, however, carries his complete outfit with him, and is wholly independent. He can avail himself of any picturesque campsite along the road.

The best manner of carrying one's equipment depends, of course, upon the style and

Health and Recreation

Catching breakfast at the front door is possible in one of America's many beauty spots easy to reach.

size of the car, and the number of persons in the camping party. Full enjoyment of a camping trip can not be had if the travelers arrive late in the afternoon at a campsite, weary, tired and muscle-bound from being sandwiched in with the camping paraphernalia. Making provision for the comfortable transportation of the passengers should be the first consideration when preparing for a camping trip.

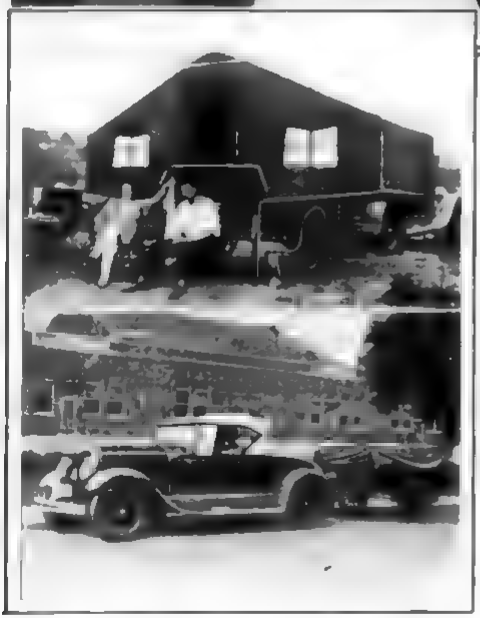
When selecting the essential articles for a camping outfit—beds, mattresses, table, chairs, campstove—one should not choose articles for their individual merit only, but should consider their compactibility as a whole. Some manufacturers put out complete outfits with "symmetrical compactibility" as a feature, and such an outfit should be considered by the motor camper.

Most of the current model cars carry the spare tires in wells at the front end of the running boards. This makes it possible and practical to fit a sizeable carrying case on the rear of the car. Any handy man can make a suitable trunk-like box of ply-board or sheet metal. To enhance its appearance, it can be covered with imitation leather. The frame of the car must be fitted with extensions to support the box. Angle-iron will serve the purpose here, and usually one of the spring shackle bolts can be used to secure the extension to the car.

Many campers neglect the front of the car as a point where much cumbersome equipment can be carried. Contrary to the general belief, a bundle carried in front of the radiator will not cause undue overheating, unless the bundle touches, or is very close to, the radiator core. The cooling system of a car depends upon the proper functioning of the fan, not upon the rush of air through the radiator by the movement of the car.

On many cars, the standard equipped bumper and bumper bracket will serve as a suitable cradle to hold such articles of camping paraphernalia, as: tent poles, folding cots, mattress, etc. Or even a portable folding

The luxurious interior of a camp trailer which may be hitched to any car. Such trailers may be bought reasonably or rented for a single trip.



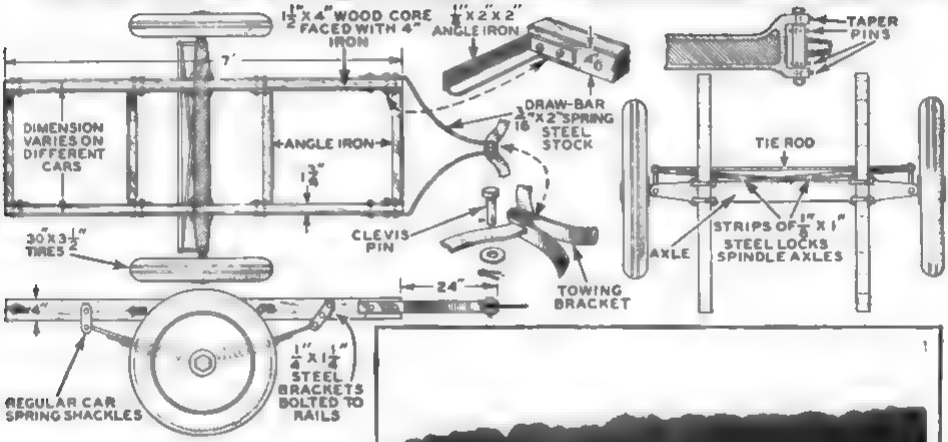
The exterior of the trailer shown above. The top photo shows the camp made ready for the night, the work of only a few minutes. Below is the complete camp equipment folded and ready for the road. This trailer home is as roomy as many of the present day kitchenette apartments.

boat can be carried at this point with no inconvenience.

The writer carried a portable folding boat in this position many thousands of miles, and found this carrying method wholly satisfactory. A portable boat will add to the enjoyment of any extended motor camping trip. A motorcamper will encounter many picturesque mountain lakes which are "boatless"—unless one carries one's own boat—and it is usually in these lakes that the fishing is the best.

And, too, thanks to the folding outboard motors now on the market, a "kicker" can be carried as readily as a suitcase. These motors, in their carrying cases, weigh less than fifty pounds, yet deliver 4 H. P. to the propeller. The folding boat—folding outboard combination should be considered by every motor camper visiting Yellowstone or Glacier National Parks. A "portable motorboat" will bring many otherwise inaccessible beauty spots in these parks within reach of the visitor. If a motor boat were hired for

A Light Trailer Chassis May Easily Be Made From an Old Front Axle



At the top is shown the proper way to pack a big sedan so that everything will be easily available when needed but nothing will be in the way to detract from the full riding comfort of the passengers. The drawings show how a trailer chassis can be made from the front axle of an old Ford, and how to make the front axle rigid by binding the tie-rod bolts and opposite king pin bolts with strips of steel. Your ingenuity will suggest what kind of a body to mount on the completed chassis.

You can carry your own outboard to use on rented boats.

these side trips, the cost would be as great as for the folding boat-outboard outfit.

When on a camping trip, there really is no need to use the doors on the left side of the car, so the left running board can be piled reasonably high with camping accessories. It is well to bolt to the running board a box with a hinged lid stretching the entire length. This box contains the staple camping provisions such as: ready prepared flour, coffee, sugar, evaporated milk, bacon, salt, dry beans, etc. Suitcases and the carcass of the tent can be carried on top of the box. A satisfactory way to hold these parcels in place is to bolt a strip of spring stock steel about 3/16"x1½" between the front and the

Folding chairs and tables, an awning tent, a spirit stove and compactly nesting aluminum dishes are easy to carry in your trailer.

A non-folding trailer home, as shown above, and a portable boat allow you to fish in comfort in any waters.

rear fenders. 1¼" bolts are strong enough to hold this bar, and if rubber faucet washers are used between the bar and the fender, the car will show practically no marring when the bar is removed after the camping trip.

A long box, just sufficiently high to permit the opening of the car doors, can also be fitted to the right running board. Tire chains, jack, tow-rope, axe, shovel, etc., can be carried here. It is well to mention that campers in any of our national forests must be equipped with an axe and a shovel.

A sketch shows a sedan orderly equipped for a camping trip.

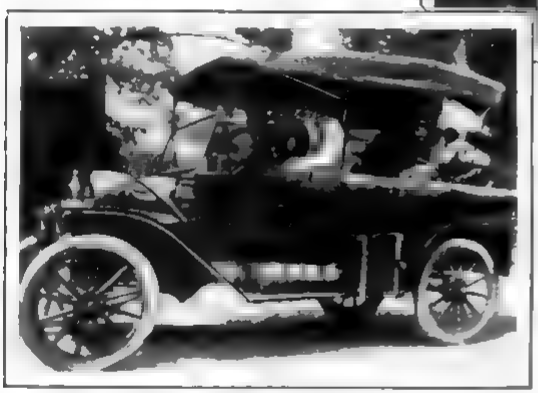
Some motorcampers prefer a trailer, and trailers are gaining in popularity, thanks to better roads. Given fair roads, a trailer offers very little impediment to the progress of the car. The only time its presence is felt is on a steep grade when the change to a lower gear must be made sooner than when running "solo". A pneumatic-tired trailer with a plain, box body can be bought for less than fifty dollars. Any handy man can make a plain trailer cheaply with only the ordinary household tools. The first requisite is a complete front axle assembly from a junked automobile. These can be obtained from any "auto graveyard" for from $2.00 to $5.00. An axle from a light car using 30"x 3½" tires should be selected. But not a Ford axle. The transverse spring on a Ford makes them unsuitable. The front axle should be fitted with semi-elliptic springs.

The first operation is to lock the spindle axles rigid to the axle proper. A sketch shows several ways this can be done. If one has the facilities to do the job, it is well to soften the spindle — or "king" bolt — and then secure it rigidly to the spindle and the axle yoke with taper pins. Invariably the spindle bolts are too hard to drill and ream without drawing the hardness. This can usually be done by heating them in a forge to cherry red and permitting them to cool down in the ashes.

A simpler way to lock the spindle axles is shown in another sketch. This consists in stretching steel bars from one tie-rod bolt — or clears — to the king bolt on the opposite side. The drawing makes this job obvious.

Another group of sketches shows how the trailer chassis is constructed. The construction is so obvious that no detail explanation is necessary.

A complete set of aluminum dishes which nest into a space no larger than a single saucepan, is now available to auto campers.



Even the ancient flivver may transport the road gypsy in comfort if due care is used in packing the equipment.

After the chassis is complete, one can fit any kind of body one desires. In fact, an ambitious man can even build a complete, self-contained camp trailer on this chassis. In that case, however, the frame should be about eight feet long.

One of the most convenient ways to motor-camp is with a self-contained camp trailer. In a few moments, these trailers can be opened out to form a cozy shelter for four people. Ice-box, food compartments and a gasoline stove are built-in features of these trailers. A commendable feature of the camp trailer is that one's "camp" is wholly contained within the trailer. When passing through a city, one can check the trailer at a parking station, and use one's car for side trips to points of interest.

A motorcamping trip should promote health as well as offer recreation. A well balanced diet is a step in that direction. There is no need for campers to live on canned beans and bacon. Stewed fruit—prunes, figs, raisins, apples—should be part of every camper's breakfast. Quick-cooking oats or bran, or ready-prepared cereals, can be served with milk product made from evaporated milk or milk powder. A very tasty omelet can be made with egg powder. Doughy foods—pancakes, flapjacks, etc.—should be eaten of sparingly.

Fresh vegetables, fruit, and berries can always be bought at wayside stands, often fresh from the farmer's garden, and these

(Continued on page 202)

Combination Auto-Motorcycle Makes Handy Runabout

Here is the combination auto-motorcycle built from old parts picked up in auto junkyard. Alex Craige, of Detroit, seated in car, is the builder.

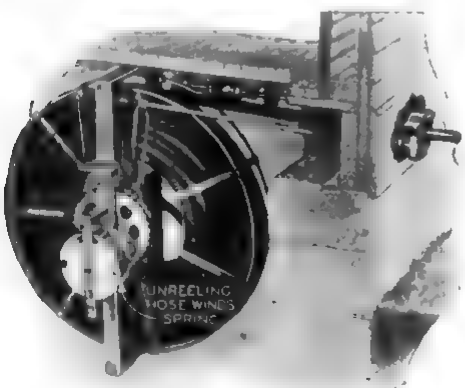
BUILDING a sturdy, serviceable combination auto and motorcycle from material rescued from the scrap heap of an auto junk yard is the feat of craftsmanship recently accomplished by Alex Craige, of Detroit. This novel car is powered by a motorcycle engine mounted on the rear above the axle, which was taken from an old auto. The front steering equipment is taken from an old motorcycle, steering being done by the handlebars. Capable of developing a speed of 25 to 35 miles per hour, the auto-motorcycle serves as a handy runabout and delivery truck.

Automatic Reel for Garden Hose

THE inconvenience of handling a garden hose when watering the lawn or the garden is eliminated once and forever by the use of a new automatic hose reel recently put on the market by manufacturers. In addition, the device prevents kinking, rotting, and freezing, and other damage due to neglect.

Installed permanently in the basement, as shown in the photo below, the hose is paid out to any length simply by pulling. A ratchet device keeps it locked at every point, and the twist of a key operates a spring which reels in the hose again. The only part visible is the neat metal plate and the key which turns water on and off.

As the hose is pulled out it rewinds the spring much as a clock is wound.



Installed in basement as shown above, this automatic reel winds in hose to prevent damage.

Freak Billiards on Oval Table

Charles C. Peterson, St. Louis billiard expert, playing on his new oval shaped table, the only one of its kind in the world, which permits freakish shots impossible on the regular rectangular table.

AFFORDING a billiard player a chance to make freakish shots that would be impossible on the regulation or rectangular table, an oval billiard table recently constructed by Charles C. Peterson, famous billiard player of St. Louis. The chief feature of the table is the circular ends which permits banks at every point of the edge. Practice on such a table, Mr. Peterson holds, gives a perfection in playing which is of inestimable value in a game on a standard rectangular table. The greatest advantage, however, lies in the unusual combination shots the table affords.

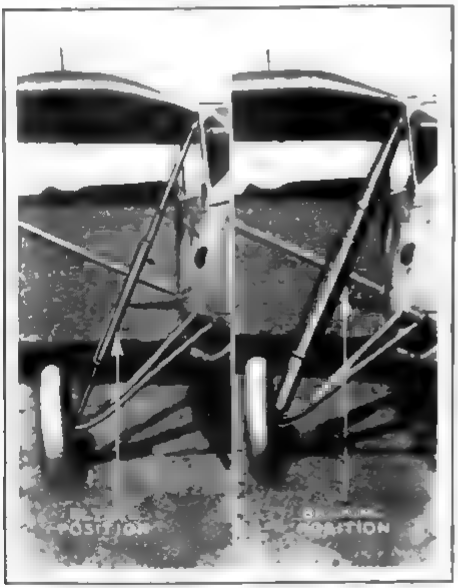
Novel 'Land Yacht' Carries Retired Naval Officer to Work

"YOU can take a sailor away from the sea but you can't take the sea away from a sailor," runs an old adage, long known among seafaring men. Such seems to be the case with W. H. Slater, a retired naval officer of Kent, England, who has constructed a novel land yacht with which to travel the five miles to and from his job, which is that of lighting wharf lamps along the riverside.

Mr. Slater's novel land yacht is made from an old truck chassis, and is powered by canvas sails, as shown in the photo at the right. Traveling over the rails of a former colliery, the yacht develops a speed between ten and twenty-five miles per hour, depending upon the winds. Although such a vehicle does not heave and roll like a ship in rough seas, it undoubtedly brings back memories to an old sailor as he shifts his sails to take advantage of every puff of wind, to say nothing of the wear and tear it saves on his legs. In a dead calm, of course, the yacht won't travel.

W. H. Slater, retired naval officer of Kent, England, riding to work on novel land yacht which he constructed from an old truck chassis and sails.

Air Brake Struts for Airplanes



The above photos show how the streamlined strut is twisted to act as an air brake.

AN ENGLISH inventor has perfected a streamlined strut which may be twisted so that its broad surface acts as a brake and slows the plane upon landing.

Light Fixture and Vent Fan in One

A NEW low priced combination fan and lighting fixture for ceiling mounting, known as "Koolite," which serves both to light and provide proper ventilation for a room, has recently been placed on the market by manufacturers. Designed for easy installation in homes and offices, the "Koolite" is compact, efficient and ruggedly built.

The semi-direct lighting of the device meets all modern requirements, and its ventilating arrangement provides for thorough, constant circulation of air in rooms of more than average size. The design diffuses the air over a large area after it leaves the blades of the fan.

The new combination lighting fixture and fan which diffuses breeze over a room.

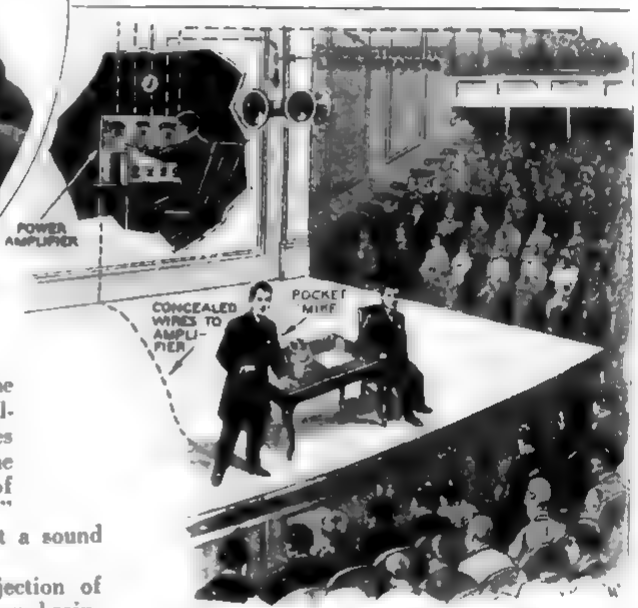
Science Finds Amazing

by DR. SERGIUS P. GRACE

Assistant to Vice President, Bell Telephone Laboratories
As told to J. EARLE MILLER

Thanks to astounding discoveries made recently in the field of sound, you will soon be able to talk around the world, deaf mutes will hear, and communication in battle areas will be revolutionized. The amazing inventions which make such feats possible are described in this article.

Dr. Sergius P. Grace, showing the new vest pocket mike which supplants microphone on stage.



In addressing large audiences, speaker's voice is picked up by pocket mike, amplified, and reproduced by speakers stationed throughout the hall.

IN A recent lecture on the new marvels being developed in the Bell Laboratories I placed my finger against the ear of one of the members of the audience, and he "heard" music and speech, though not a sound was audible on the stage.

That was electrostatic projection of speech directly into the human brain. The speech had been transformed into high voltage electric current, passed through my body, while the ear drum and surrounding tissue of the subject acted as one plate of a condenser receiver.

Just a laboratory experiment, so far, yet it is one of many new discoveries that are opening new leads into the field of hearing, helping improve devices for the transmission of sound, and bringing hearing back to the deaf. It is quite possible, as some research workers have suggested, that science may make it practical to "hear" without using the ear drum at all.

Hearing, it has been discovered, is partly an electrical manifestation in which a minute current is generated in the auditory nerve. At Princeton University not long ago electrical contacts were established to the auditory nerve and brain of a cat, the minute current in the nerve amplified through radio tubes, and words spoken into the ear of the living cat in one room were reproduced through loud speakers in another.

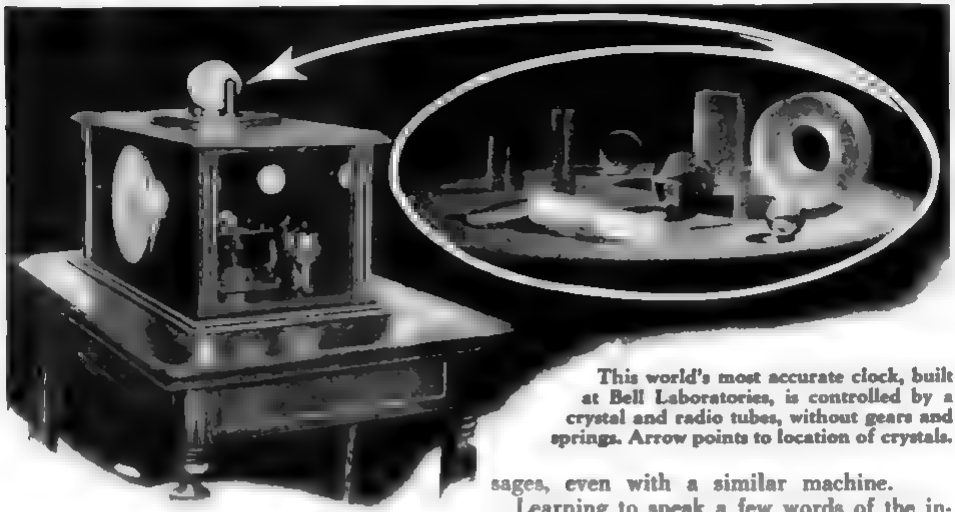
At Bell Laboratories we not only have developed special apparatus to make it easier for deaf people to use the telephone, but we have also created several portable outfits, known as audiphones, which help these unfortunate ones to join again in conversation with their friends. Few people realize that there is a definite upper limit to the loudness that the ear can stand, so that extreme cases of deafness are beyond the aid of even the most potent amplifier.

NEW USES for SOUND

Using the new talking arc shown in the photo at the left, troops in front line trenches can communicate with rear without danger of eavesdropping by enemy. Ray from talking arc beam is picked up by photocell and transformed into voice by the amplifier.

Under the guidance of Dr. Harvey Fletcher we have developed the audiometer, an instrument to measure hearing. It shows conclusively that no two cases of deafness are quite alike, and that hearing-aid that proves successful for one person may be quite unsuited for another. Dr. Fletcher has developed a simple method in which some one reads off lists of words, at a distance of three feet from the pick-up device. One list contains fifty words such as "bat, bite, boot, beat" in which the vowel is different for each; the other has fifty words in which the consonant differs such as "by, high, thy, guy, why". After making this test with several hearing aids, and scoring errors in the consonants twice as heavily as in the vowels, the user can decide which device best suits his particular kind of deafness.

The projection of speech direct into the brain is only one of the fantastic marvels of recent years. Every day the air is filled with trans-oceanic radio telephone messages, winging their way between New York and Europe, South America, Australia and South Africa. From any telephone in the United States you can call any telephone subscriber in those far flung quarters of the globe, but when you talk no eavesdropper can listen in. Far down in lower New York your voice



This world's most accurate clock, built at Bell Laboratories, is controlled by a crystal and radio tubes, without gears and springs. Arrow points to location of crystals.

passes through a speech inverter mechanism which turns it into a new language, unintelligible to the ear. With patient practice one can learn some of the inverted words, but many are sounds which the human larynx cannot master.

The speech inverter is quite simple in theory. Normal telephone speech falls between vibrations of 100 cycles up to 2,900 cycles. When the speech is inverted, for every vibration is substituted a new one whose frequency is equal to some selected constant frequency, less the frequency of the original sound. We use 3,000 cycles for the constant frequency, and a deep bass note of 100 cycles is thus transformed into a high soprano of 2,900 cycles, while the high notes are inverted to deep bass. The result is much like passing light through a camera lens, which inverts the image, so the top of the picture is focused on the bottom of the film in the camera, and the bottom of the image appears at the top.

At the other end of the trans-oceanic radio phone circuits similar inverters reverse the process, and the party at the other end hears normal speech.

If there is another war the speech inverter may revolutionize the secrecy problem, not only in radio conversations, but on the telephone lines at the front. For, by simply changing the cycle according to a pre-determined arrangement, the enemy would be unable to pick up and translate the messages, even with a similar machine.

Learning to speak a few words of the inverted language, so you can talk into a microphone and have them come out of the inverter changed into intelligible English, is an interesting experiment. If, for example, you can say "Cyaneon Playafeen Acecilofin" into the transmitter, the inverting apparatus will repeat back "Illinois Telephone Association". There are always portions of the sounds that no human throat can master. Such a simple word as company, for example, becomes crink-a-nope.

Speaking of possible war uses of new sound apparatus, the "talking light", one of the most interesting things still in the laboratory experimental stage, offers an opportunity to develop secret wireless communication from the front lines to the rear.

The talking light is an electric arc in which the flame acts as a loud speaker, and can be made to speak with almost the volume of a good dynamic speaker. The principle behind the phenomenon was discovered by the inventor of the telephone, Alexander Graham Bell, and Hammond V. Hayes, one of the early Bell System engineers. They found that speech could be transmitted by a beam of light, and also that when a telephone transmitter was connected across the terminals of an electric arc between carbon rods the flaming arc would reproduce the words spoken into the transmitter. At the same time beams of light were sent out which could be used to transmit speech several miles.

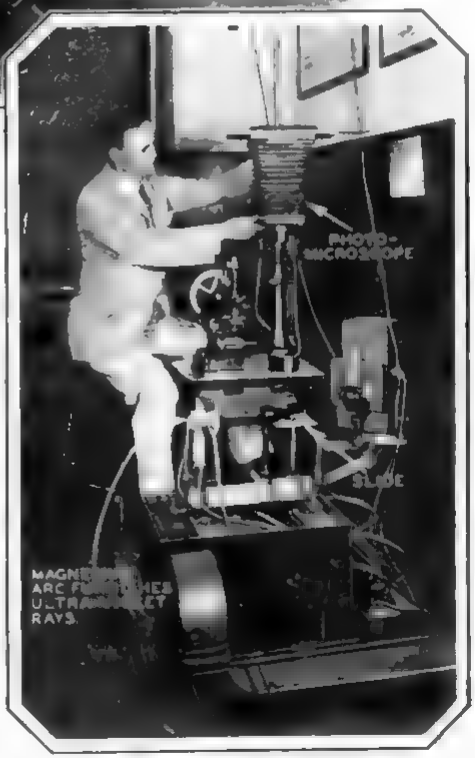
We have found that the light not only talks, but that it is modulated by the voice current

Microphones in Vault Walls Detect Faintest Sounds of Thief at Work

Bank robberies are prevented by super-sensitive microphones in vault walls which detect sound of flame, but are insensible to car rumblings, etc. When operator hears sound of flame or tapping in the speaker, he dispatches guards to capture the thief.

just as the glow of a neon lamp is modulated by the signals reaching a television receiver. It is possible by using photoelectric cells to pick up the beam of modulated light to reproduce it directly at a distant point as spoken words. Such a system would be the last word in directional wireless, for no one could listen in save by inserting a photoelectric tube in the beam, and with the latter directed from the front lines toward the rear, the enemy could not eavesdrop.

Audiences listening to some of my talks on our work at the Bell Laboratories have been mystified by the fact that, though I am constantly walking about the stage, and no microphone is in sight, my voice reaches them, greatly amplified, through public address loud speakers. The secret is a tiny microphone, no larger than a quarter, hidden in the breast pocket of my coat, and connected to a trailing wire passing down to the floor inside my clothing. Originally a development of an improved transmitter for telephone operator, the device is now serving in a totally different field.



A saving of $10,000,000 worth of lead in telephone cables was made last year by use of the photomicroscopic equipment shown above. The device also makes layer photographs of living cells, magnifying them 5000 diameters.

Secrecy on Radio Furnished by "Scrambler" Which Changes Sounds

The speech inverter which plays important part in trans-oceanic radio communication, for it scrambles voice to prevent eavesdropping. "Illinois Telephone Company" will be sent over air as "Cyaneon Playafeen Acecilofin."

This drawing illustrates experiment by which cat's ear was made to serve as mike.

Dr. Grace holding in his left hand high power trans-Atlantic radio tube, and in right hand little speech delay relay which stores up voice for several seconds to prepare circuit for voice of speaker.

Another use for small and extremely sensitive microphones is in guarding the vaults of the Federal Reserve and many other banks. Tiny microphones are set in the vault walls, and they are so sensitive that a hand tapping against the vault will set them off, while they are so adjusted that they remain insensitive to footsetps passing near, to trucks in the street, and to the rumbling subway trains.

A very clever electrical engineer might possibly locate one of the circuits, and, after study, determine just the right amount of resistance to put into the line and so circumvent the microphones while bank robbers could work. So, to guard against that bare chance, the watch service officers are provided with a device by which, at frequent intervals, they can sweep through a whole cycle of resistance changes and determine whether any one has been tampering with the circuit. The cleverest bank robber doesn't have a chance with this system.

Another laboratory experiment which always fascinates the public is the speech delay mechanism, which, in one form, is just a clever amusement device, and, in another, is an important part of the trans-oceanic radio telephone system. With a long coil spring connected to a telephone transmitter at one side of the stage it is possible to so delay the movement of the voice vibrations along the wire that you can speak in one end and hear the words come out the other quite a bit later. That's more or less a me-

(Continued on page 196)

Three Wheel Taxi Built Like Hansom Cab

THE last word in comfort and convenience for taxi passengers, particularly passengers loaded down with bundles from a shopping tour, is provided by a unique taxi now being designed by automotive engineers. With this car, the passenger can step from the curb right into the tonneau without inconvenient squirming and stooping, as in the ordinary taxi. The driver sits in the rear, like the driver of a hansom, from where he controls the door on the front of the car and operates the steering wheel.

The car is provided with only three wheels.

Here is unique taxi which drives to curb to receive passengers.

New Wrinkle in Twin Motor Mount

Twin motors mounted sideways in wing-like structure are features of this new Lockheed airplane.

TWIN motors mounted sideways instead of right side up, in a peculiar wing-like structure on the front of the plane, is the most radical feature of a new monoplane designed by Allan Loughead, well known inventor of the Lockheed plane. This new method of engine mounting substantially reduces wind resistance, providing, in fact, a slight lift, and in addition aids considerably in the ventilation of the motors.

In the trial flight, unfortunately, the plane was caught unexpectedly in a sudden gust of wind and wrecked. The test flight prior to the crash, however, proved the new principle a success.

Sun Lamps Increase Egg Laying

A SEVENTY per cent increase in egg production by a flock of 180 chickens treated two hours daily by ultra-violet rays is reported following a test conducted by poultrymen. A flock of pullets was divided into two groups, each receiving the same food and ventilation. After a month's test the group treated with rays showed 70% gain.

Wash Machine Motor Drives Auto

TWO fledgling wizards of the automobile industry, Joe Smalley and Don Graham, of Pittsburgh, Pa., have designed and built for themselves a novel runabout bus which, powered by an old washing machine motor, can speed along at the breath-taking rate of 12 miles per hour—on level roads. The car gets about 25 miles on two quarts of gas which it carries in a tank on the rear.

Joe Smalley and Don Graham with their wash-machine bus.

Original DESIGNS WIN

The prize-winning mid-wing monoplane designed and built by Wilson F. Miller, of Oneida, N. Y., is powered with a Harley "74."

Does anybody really build those home-made light airplanes? Brother, you'd be surprised! And so were the editors when they saw the response to the M M home built light plane contest.

This photo of the uncovered fuselage of Miller's plane reveals ruggedness and economy in construction. Design is original.

DON'T swat that fly! It might be one of those light plane fans who failed to win a prize, and who is buzzing around your ears to convince you that his home-built plane will really fly.

But you don't have to convince the judges of MODERN MECHANICS AND INVENTIONS' Light Plane Contest, which was announced in the December and January issues and which closed March 1st, for we've seen pictures of your ship from the time you made your first wing rib until you cracked her up on Farmer Brown's forty acre cow pasture, and we know you have a hum-dinger. But, of course, everybody can't win when there are so many entries, so with deep regrets to the losers, we'll now offer our congratulations to those who copped the money and tell you about the winners and their entries.

Wilson F. Miller, who lives at 424 Broad St., Oneida, N. Y., takes off with the $100 check in his pocket as first prize. He noses out the other entries because he gives us something that we have been looking for. It is possible that we will be able to present detailed plans for construction of this ship in a future issue of MODERN MECHANICS AND INVENTIONS.

But let the winner tell you about his plane:

Dear Sir:

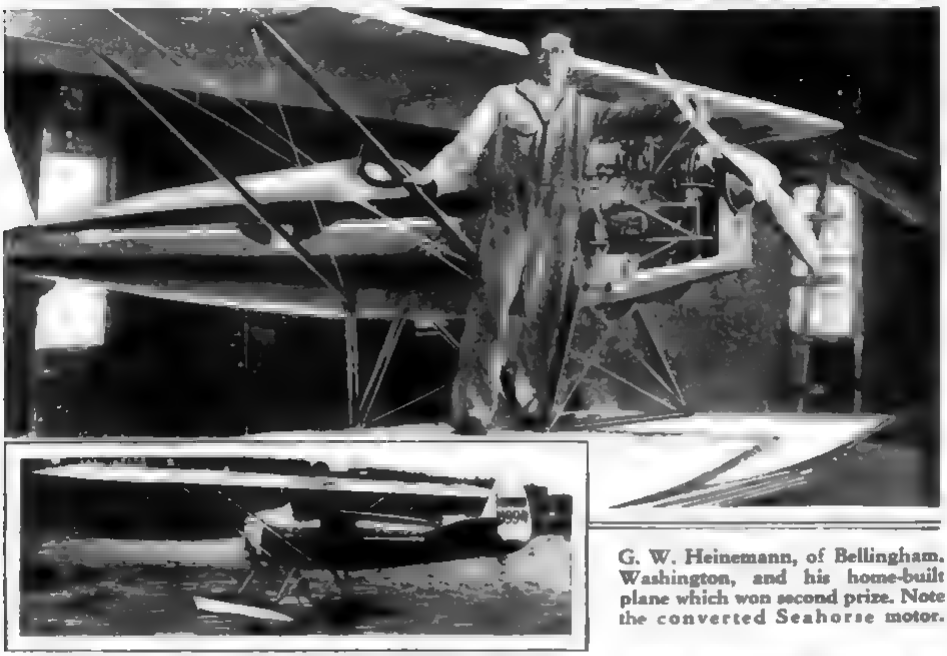
I am sending photos and drawings of the little job which I designed and built throughout, including the propeller. All that I bought were the wheels and motor.

I was 16 years old and a high school student when I made this plane, and money was low as is the case with students, so this was built with the utmost economy. The ship was finally completed, and then came the problem of who was going to fly it, for flyers are few and far between and airports are unheard of in this section.

Finally a barnstormer came to town and I took six hours and could stagger around. So one fine morning I brought the grasshopper out and took it to the field. After careful running up and down the field for several days I felt ready, so giving her all she had away we went and success was mine. The photos tell the story.

WILSON F. MILLER.

Light Plane Contest Prizes



An original conversion of an outboard motor and the clean lines of this seaplane parasol monoplane won for its designer second prize. This ship has also been flown as a land plane.

G. W. Heinemann, of Bellingham, Washington, and his home-built plane which won second prize. Note the converted Seahorse motor.

Mr. Miller goes on to explain that he feels that his is the ideal ship for beginners to build, as the construction is simple and strong and will stand up under hard usage, and the motor is easily obtained.

Second prize, a check for $50.00, went to G. W. Heinemann, Box 182, Bellingham, Washington. His entry was a plane built along the lines of the Heath Parasol and powered with a Johnson Seahorse 32 H.P. outboard motor. Photographs show that this ship has flown with both pontoons and wheels. The reduction gear and cooling system for this job were designed by the builder, making the outboard motor into an almost vibrationless power plant.

Robert R. Retz, of Farmland, Indiana, wins third prize with his little biplane powered with a Rathel air-cooled Chevrolet motor which develops 50 horsepower. Although at first glance this job resembles the Lincoln Sport Biplane, construction shots reveal several important differences. The ship was test flown at Keesling Airport and proved to be very fast and highly maneuverable.

Photos of other prize-winners, on following pages, testify to wide interest in contest.

The Retz Biplane, built by Robert R. Retz, of Farmland, Indiana, is winner of the third prize. This plane is powered with a Rathel air-cooled fifty horsepower Chevrolet motor.

Original Designs Predominate in These Light Plane Contest Entries

Albert Hocker and his plane designed by C. J. Ross, of Evansville, Ind., and powered with Heath Henderson motor.

Albert Hocker

Roy K. Geltz, of Lancaster, Pa., built everything on the above plane with the exception of the motor, which is by Sensenich.

Another original design, this time by James Baldwin, of Lewiston, Idaho. It hits 90 per with a Heath motor. Note the streamlining.

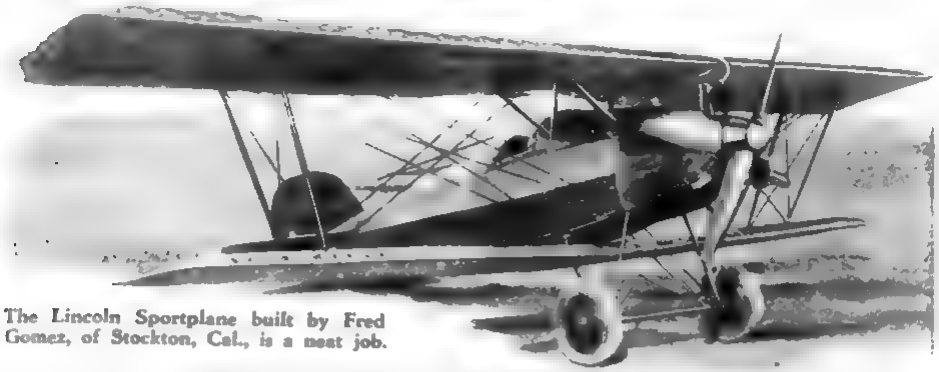
A Model T engine gives this original monoplane a speed of 93 m.p.h. G. F. Klampfer, of Wichita, Kan., built it in his spare time with little expense.

This original air-cooled motor, which Stanley Aldred, of Kewanee, Ill., placed on his Heath Parasol, develops 35 horsepower at 1800 r.p.m.

The builders of the planes appearing on these two pages have been awarded $5.00 each as consolation prizes. Any of these might easily have won had it not been for the general excellence of the three which were finally picked. Study of these photos will reveal several original designs among the old familiar planes which have been built according to M. M. plans.

Below are listed several who deserve honorable mention for especially meritorious work in design and construction.

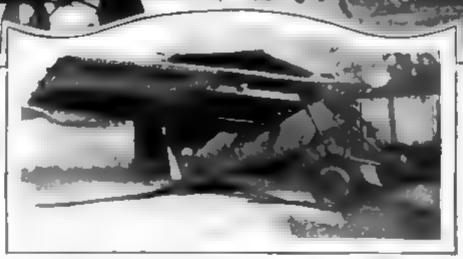
Paul Aveline, Jr., Portland, Ore.; W. G. Thomas, Chicago, Ill.; Lavern P. Kowalke, Wall Lake, Iowa; Frank J. Drouin, Ballard Vale, Mass.; Osborne Koehlert, Encinitas, Calif.; Charles M. Petrie, Kremlin, Mont.; Sylvan Zimmerman, Palmyra, Wis.; and Glenn Berk, Blissfield, Mich.



The Lincoln Sportplane built by Fred Gomez, of Stockton, Cal., is a neat job.

Leland R. Kirby, of Courtenay, B. C., Canada, designed and built the low-wing monoplane shown at the left. It is powered with a Dayton "Bear" 110 horsepower motor and is a three-place job.

Paul Coleman, Clinton Gillette, and DeVere Palmer, of Almond, N. Y., built the above plane around plans of the Lincoln Sportplane as published in Double M. The motor is an Anzani.

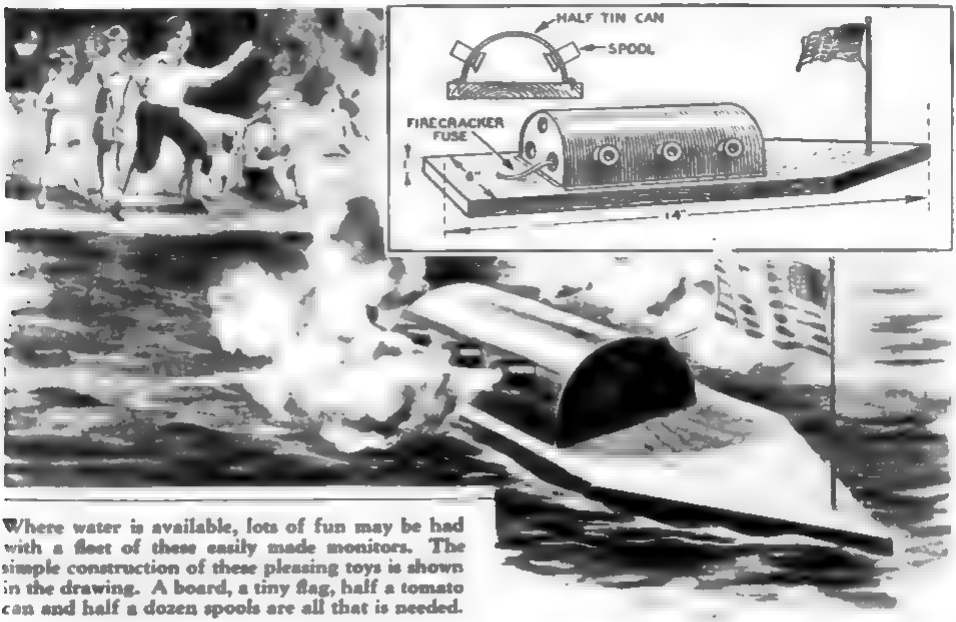


Wellington Smith, of Fort Frances, Ontario, built the above Heath Super-Parasol and then taught himself to fly it off the snow with only a few minor crackups.

Here's Glen Williams' highly original metal job.

W. E. Sambrooke, of Bassano, Alberta, designed and built this cabin job and then secured a license.

Making Your Own



Where water is available, lots of fun may be had with a fleet of these easily made monitors. The simple construction of these pleasing toys is shown in the drawing. A board, a tiny flag, half a tomato can and half a dozen spools are all that is needed.

The big idea of July Fourth seems to be to make more noise in the day time and more brilliance at night than the other fellow. But if everybody buys from the same store, it's only a matter of who has the fattest purse. This article tells you how you can have more fun than your neighbor at lower cost, by making your own fireworks.

FROM across the street came a reverberating "BOOOMMMMM" about every minute. It was mid-afternoon and most of the youngsters had shot their kits of torpedoes and firecrackers long ago. There seemed to be no one in sight. Yet every so often came that loud noise and I got curious. The noise apparently came from behind a large bill board and so presently I went over to investigate. There, in the cool shadows were two ragged little fellows and a dog, having the time of their lives. Seemingly too poor to enjoy the usual offerings of the Fourth, they had acquired a pile of large, kraftpaper sacks and were blowing up these and breaking them against the bill board which only heightened the noise. It acted as a sounding board.

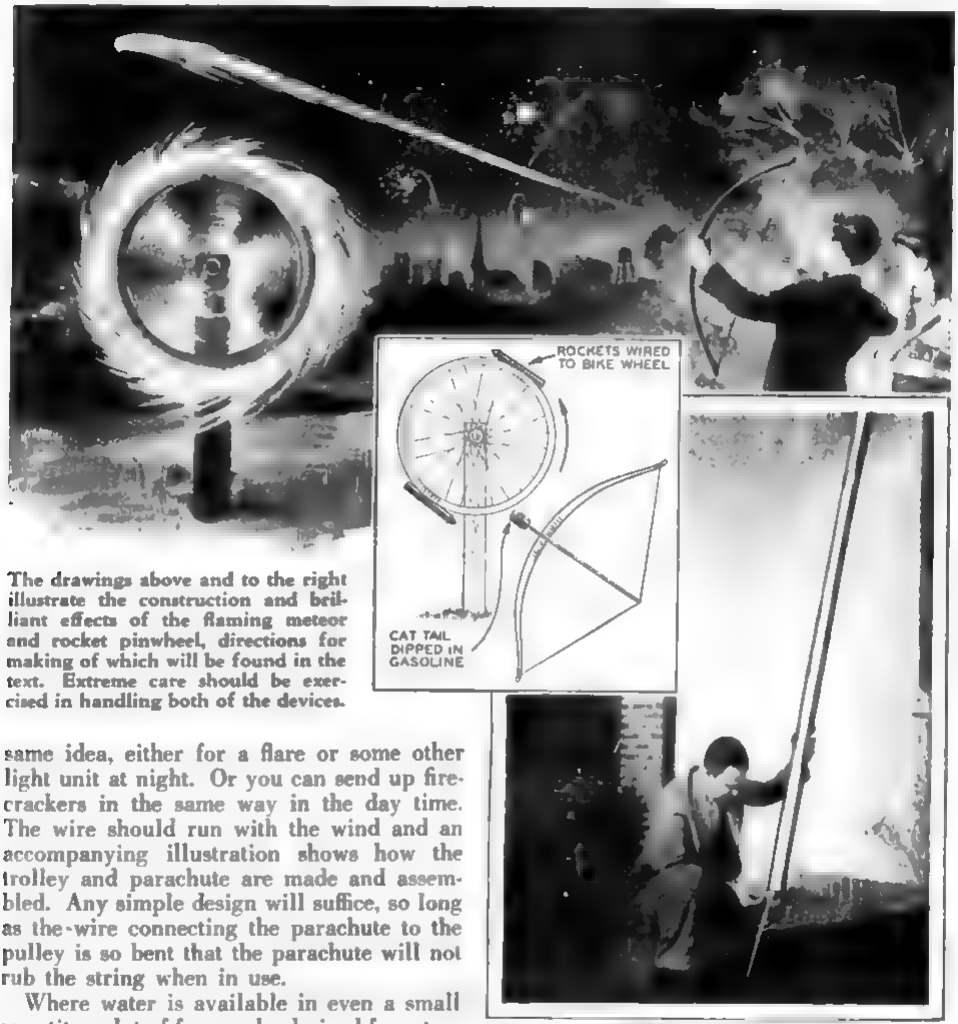
We seem to want noise in the day time and brightness at night for our Fourth of July, and the fun is there, regardless of how the noise and brilliance is achieved.

A boy in another neighborhood, a few years ago, used to send up a red flare along his kite string, providing there was a breeze after dark. It was a simple contrivance that did the trick; a small pulley wheel with wire frame and a parachute to catch the wind and pull the heavy flare up the incline. That single red brightness high up in the air was more impressive than a whole lawn-full of them going at once on the ground. And the fellow got plenty of publicity. You could spot the thing a mile or more away.

Even though there's no wind, and you want something different, you can run a stout string or small wire from a stake in the ground up to a high tree limb, the house chimney or a telephone pole, and use the

4th of July Fun

by DALE VAN HORN



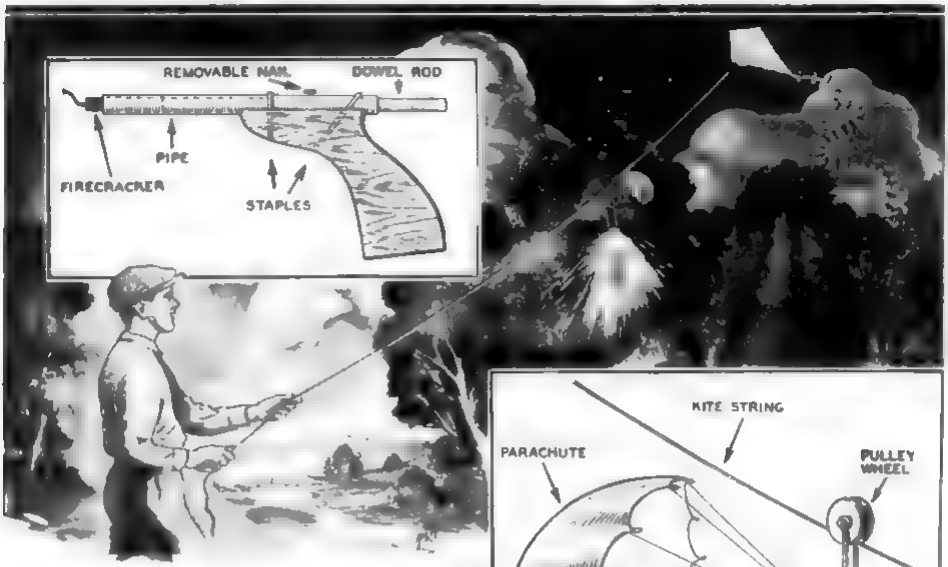
The drawings above and to the right illustrate the construction and brilliant effects of the flaming meteor and rocket pinwheel, directions for making of which will be found in the text. Extreme care should be exercised in handling both of the devices.

same idea, either for a flare or some other light unit at night. Or you can send up firecrackers in the same way in the day time. The wire should run with the wind and an accompanying illustration shows how the trolley and parachute are made and assembled. Any simple design will suffice, so long as the wire connecting the parachute to the pulley is so bent that the parachute will not rub the string when in use.

Where water is available in even a small quantity, a lot of fun can be derived from two or more of the easily made monitors shown in an accompanying illustration. Being needed only for a short time, they are hastily made from a board and half a tin can in which several holes have been cut. A small flag should be attached as shown. Fasten the can down with tacks, so that by springing the sides, it can be removed.

To use, twist the fuses of several firecrackers together and loosely tie a short, thick cotton cord to them. Place the crackers inside and run the cord through one of the holes. Two or more of the monitors should be prepared and launched at the same time from an upwind shore so they will move out upon the water. As the boats are launched, light each cotton cord. It will burn with a spot of red and after an interval the fire reaches the

The author lighting the fuse of his rocket gun, which merely consists of a long length of rain pipe and some 15 cent rockets. It is well to have a second person hold the pipe.



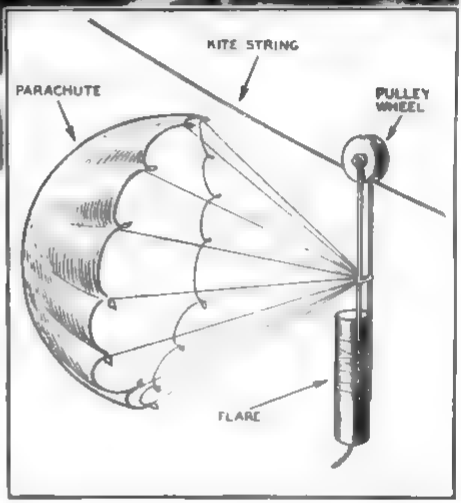
The parachute flare making its ascent up the kite string. The inset shows the simple construction details of the home-made cracker pistol which is easy to make and safe to use.

fuses. When this happens a regular miniature water battle will ensue with the popping of the crackers and smoke issues from the holes. A piece of punk can be used instead of the thick cotton cord if desired.

The cracker pistol will please the kiddies immensely. The fuse at the end is lighted, then the gun quickly aimed and "Bang"! it goes. To clean the barrel, lift up the nail which locks the round wooden rod, shove this ahead through the barrel, then draw it back in position and replace the nail for the next shot. No danger results from this weapon because the cracker explodes only from the muzzle, and this of course, is held away from the face.

Get a small hollow tube of, say, 3/8 in. inside diameter and 10 in. long. A small pipe will do, or you can find an excellent source from an old brass bedstead. Cut out a stock and grip from white pine to fit the hand nicely. Groove the top to seat the barrel as shown. Fasten this snugly in place with two "U" shaped wires which are passed down over the barrel and are twisted tight underneath.

Get a dowel or any round wooden rod to slide through the barrel easily. Drill a small



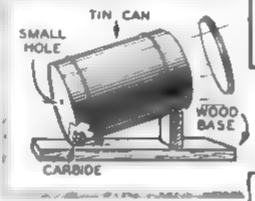
The simple details of the parachute flare. Wind, filling out the 'chute, pulls the lighted flare up the kite string. The wire should keep the 'chute away from the string to avoid entanglements.

hole through the barrel top and another through the dowel at such a point that the front end of the dowel will be far enough back from the muzzle to permit seating the cracker as shown. Then cut off a small nail so the head will protrude slightly. After each shot, the dowel is pushed ahead to shove out the remains of the exploded cracker.

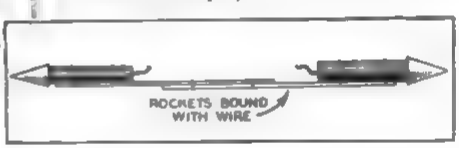
If plenty of open space is available, the flaming meteor will furnish a thrilling spectacle. A stiff bow and some dried cat tails are needed. The cat tail stems become the arrow, while the head is broken off to leave about half the fluffy end and this is dipped in gasoline or kerosene. An instant after it is lighted, it is shot high into the air and long streamers of flicking fire tail far behind. Of

A Simple Carbide Cannon Makes a Cheap and Effective Noise Maker

Here's another simple stunt. Rig up a coffee or similar can with a removable lid as shown. Place some carbide and water in the can and light a match to the hole.



Flash crackers wired to the stick of a rocket are set off by the sparks, causing an original and brilliant display.



Wire a small rocket to the stick of another at least twice its size. Shoot the big one through a pipe as described in text and watch the aerial tug of war when the smaller rocket is ignited.

course this should be used entirely away from buildings or anything which might possibly catch fire. An arrow with rags wrapped tightly about the tip can be used in place of the cat tails, or an arrow of stiff wire will permit using it over and over.

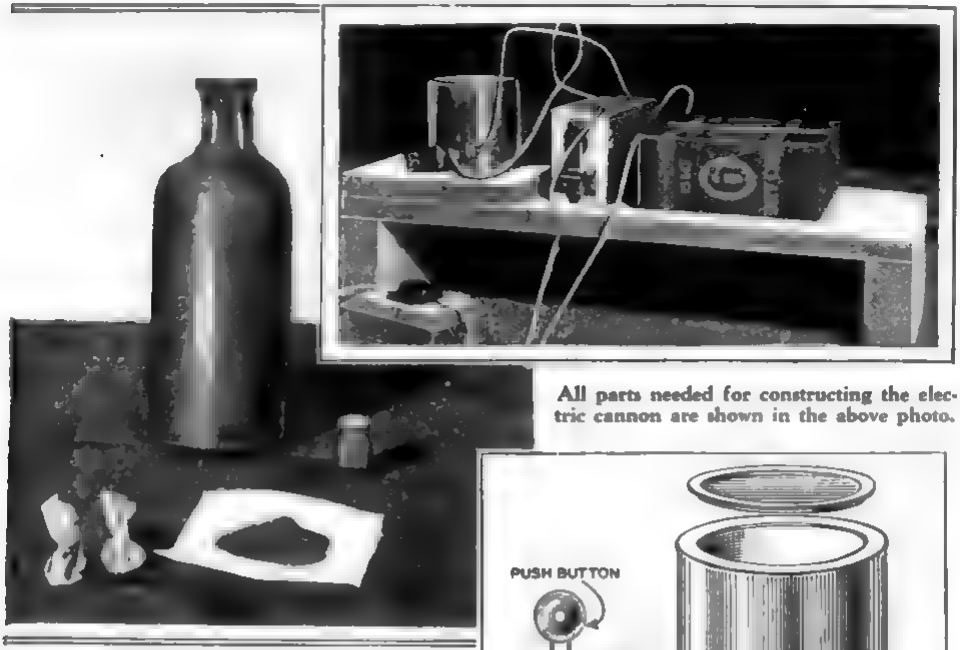
In some sections boys often use another spectacular stunt. They make a ball 3 inches in diameter from old rags and bind it with small copper wire. They don old gloves (although the writer has participated with bare hands unharmed), soak the ball in kerosene and light it. Then they play ball! The trick lies in throwing the flaming sphere as quickly as possible after catching it, to another of the party. One soaking with coal oil will last several minutes and on a dark night, the performance is especially thrilling.

Another ingenious noise maker requires a tire pump. Unscrew the base, reverse the leathers in the barrel, and tear up some *thin, tough* paper into 3 inch squares. Fit one of these over the end of the tube and either hold it with your hands or slip a rubber band over the edges, then quickly pull the plunger to the top of the tube. A quick vacuum is created which pops the paper with a loud, hollow report.

Here's how you can get as much fun from a 15-cent sky rocket as you ordinarily get from a 50-center. The only equipment needed is a length of rain spout or other large diameter pipe. Two persons are needed. Slip the rocket, point up, in the pipe with the end of the stick resting on the ground. One person raises the pipe until the fuse is exposed. The other person lights it. The instant the fuse catches, the pipe is dropped tight onto the ground and the rocket roars from the top like a charge from a cannon.

The explanation is simple. With the usual method, there is no confining of the gases;

Electric Cannon Loaded With Bag of Black Powder Produces Loud Roar

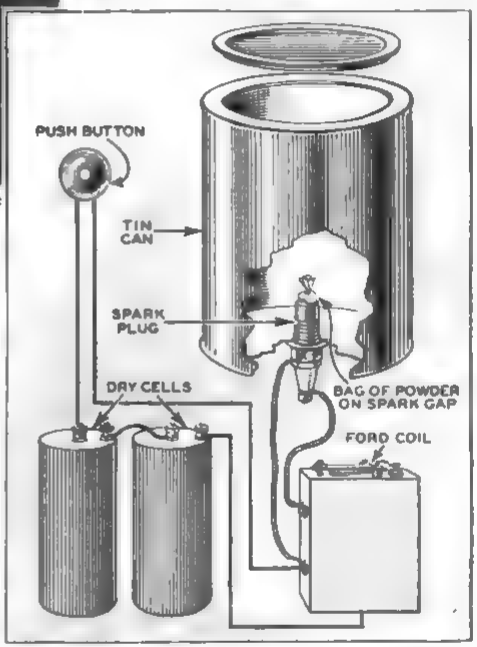


All parts needed for constructing the electric cannon are shown in the above photo.

Powder charges which produce the explosion in the electric cannon are made by placing a small quantity of black powder on a sheet of tissue paper, which is then twisted as shown in photo.

here they are confined and the writer has often sent small, cheap sky rockets higher and farther than much larger and more expensive ones can be sent by the trough method. Another advantage is that by merely aiming the pipe, you can pretty accurately tell just where the rocket is going. Besides, the stick doesn't wobble when shot through the pipe. The speed of the rocket, as it leaves the pipe, is terrific. There is no danger in using this method and several rockets can be fired in rapid succession before the metal becomes hot.

Another rocket stunt is this: to a large rocket stick, tie in reversed position a rocket not more than half its size, in such a way that the fuse of the smaller rocket will be in line with, and some 12 or 15 inches from, the other fuse. This hookup should be used only through the pipe, described above, to insure plenty of height with the added load. This is somewhat risky so take no chances. After the large rocket is lighted and leaves the tube, the sparks, sooner or later, ignite the smaller rocket and if this occurs about the time the first rocket is exhausted, a quick right-about



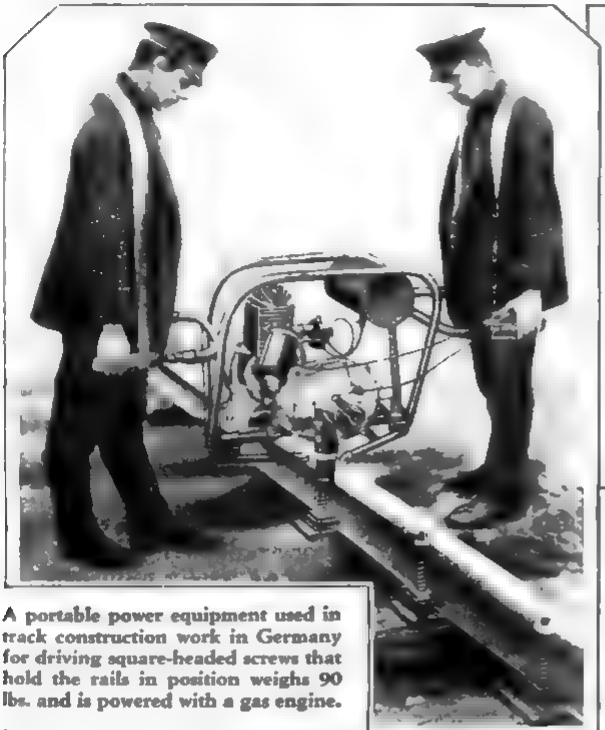
Spark plug, coil, dry cells, and push button are wired up as shown. To mount spark plug more securely, fasten the can to a baseboard and thread hole in bottom to take the spark plug. To fire cannon, place powder bag on gap as shown here.

occurs high up, and the smaller rocket, now only with the empty shell as load, continues on its flight.

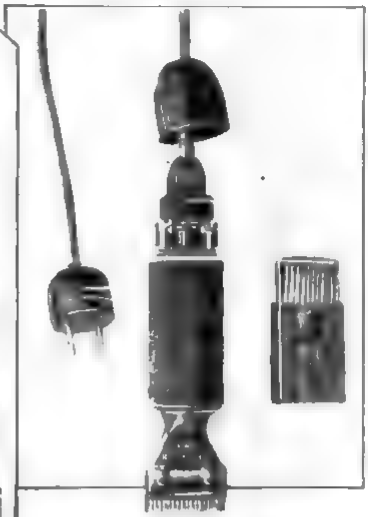
Or, a bunch of flash crackers can be wired to the stick of a single rocket. Be sure to wrap the stick with tin or aluminum to prevent breaking. Each cracker should be fastened in

(Continued on page 186)

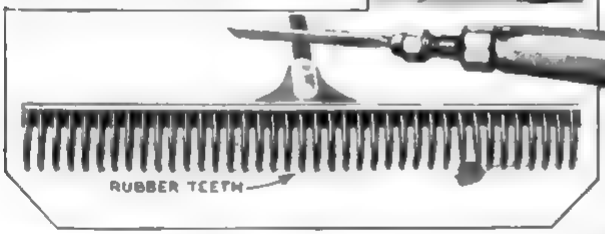
Modern Tools Do It Quicker



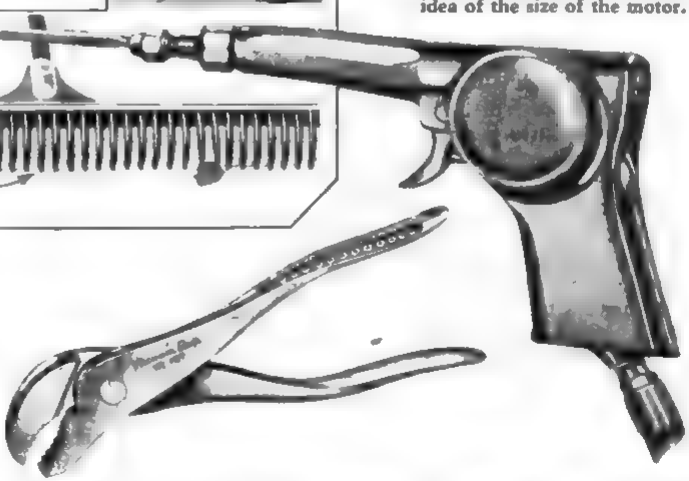
A portable power equipment used in track construction work in Germany for driving square-headed screws that hold the rails in position weighs 90 lbs. and is powered with a gas engine.



Another German development is an electric hair clipper that derives its power from a small motor about the size of a half dollar. Holes in the bottom and the cover provide a circulation of air for cooling the motor. In the illustration the cover is raised, allowing the motor to be seen. The match box gives an idea of the size of the motor.



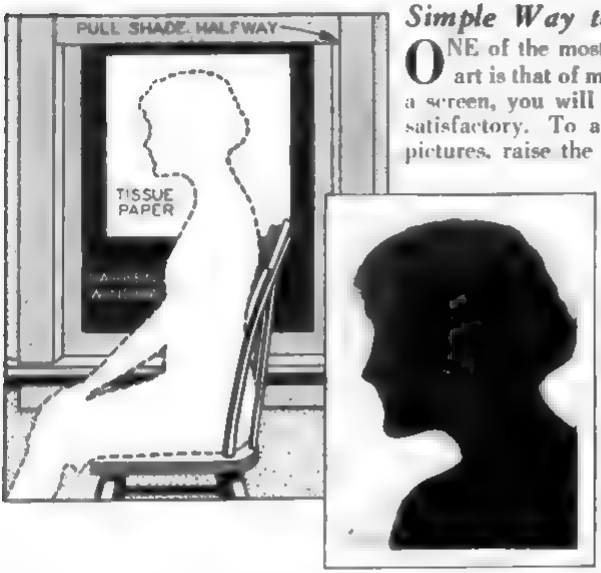
With teeth made of rubber the above lawn rake has several advantages over the ordinary metal pronged rake. The rubber teeth adjust themselves to every irregularity of the ground surface and sweep clean. They cannot tear or uproot grass and have a springy action that helps shove the leaves into the pile at every stroke. The rubber resists wear, stays elastic, and stands all kinds of distortion without danger of breakage.



The air filer shown above has a pistol grip which gives the operator easy access to any type of work. The tool weighs one and one-half pounds and is seven inches in length. It operates at speeds from 500 to 5,000 strokes per minute, depending upon the operator's pressure on the trigger. Below is shown a new tool which combines a dozen types of grippers and wrenches in one powerful pair of pliers with vacuum grip handles. The jaws of the pliers will fit nuts or pipes of any shape.

HANDIKINKS

Modern Mechanics and Inventions editors are always on the lookout for handikinks—simple, easy stunts for performing various jobs about the house, in the workshop, garage—any place that handyman tasks are done.

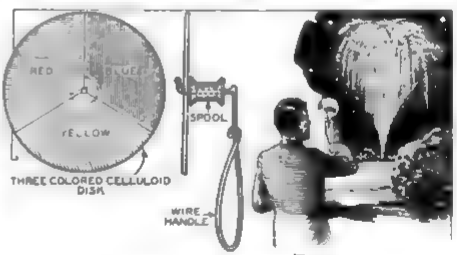


Simple Way to Make Silhouette Photos

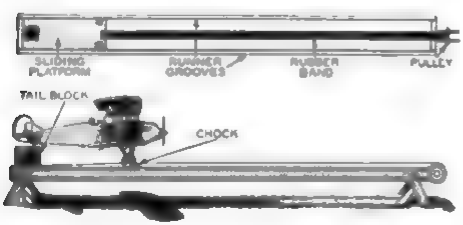
ONE of the most fascinating phases of the camera art is that of making silhouette photographs. For a screen, you will find a window facing north most satisfactory. To arrange the screen for good clear pictures, raise the shade about half way, then paste in the center of the lower pane of glass a thick, smooth sheet of tissue paper. Next darken the window around the paper, then shut out all light from the room. Place a chair before the window so that the head of the subject will come in the center of the tissue paper, as illustrated in the accompanying drawing. Focus your camera carefully, getting a sharp outline of the profile on the screen. Correct exposure depends upon the lens, light, and plate. The important point is to get a black and white negative.—W. C. Menyhart.

Novel Spinning Celluloid Disk Shows Fireworks in Ever-changing Colors

TO GET the full benefit of your fireworks on the Fourth of July, view them through this simple little spinning color disk. The disk is made from three pieces of celluloid cut to pie-wedge shape and glued together as illustrated at the right. Most attractive effects can be had by using blue, red and yellow celluloid pieces. The completed disk is tacked to a spool, which is mounted on a wire handle for spinning.—L. B. Robbins.



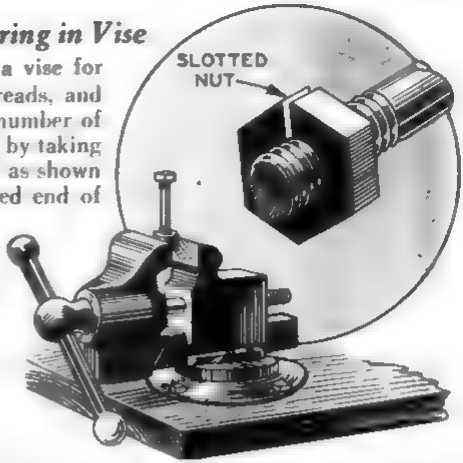
Simple Toy Catapult for Launching Model Airplanes Into Long Flight



YOUR model plane will travel a great distance if you launch it from a catapult like the one illustrated in the accompanying drawing. This device is simply a grooved platform made from a plank, and set on a trestle. A sliding platform which holds the plane slides down this groove, powered by a strong rubber band.—Orvin Maine.

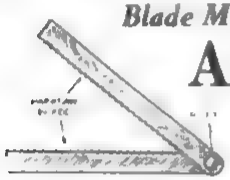
Labor Saving Workshop Ideas

Slotted Nut on Threads Prevents Burring in Vise



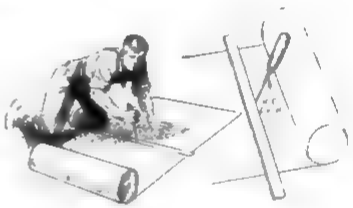
GRIPPING the threaded end of a bolt in a vise for filing usually proves ruinous to the threads, and renders the bolt useless. If you have a large number of bolts to work on, you can make your task easy by taking a nut which fits the bolts and filing a slot in it as shown in the drawing at the right. With the threaded end of the bolts inserted in this slotted nut, you can clamp them tightly in the vise without injuring the threads in the least. The nut in yielding serves as a pad to prevent burring of the threads.—Max Olmand.

Blade Makes Bevel Square

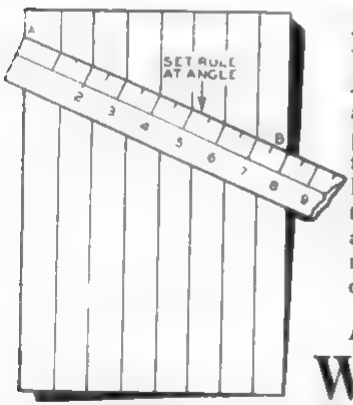


AN improvised, but none the less serviceable, bevel square may be made from an old hack saw blade, which should be cut in half and riveted together at the ends through the holes as illustrated in the accompanying drawing.—Ralph Neuenschwander.

Asphalt Roofing Cut Easily With Ice Pick



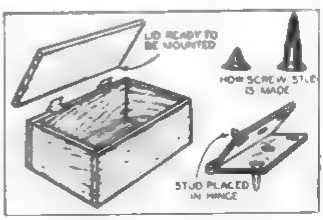
A COMMON ten cent ice pick will prove much more satisfactory for cutting asphalt roofing than the sharpest of knives. The thin sharp point of the pick leaves no room for the asphalt to stick, and when the pick is used with a straight edge, smooth cuts can be made with a minimum of effort.—Roy Green.



Dividing a Board Into Strips of Equal Width

HERE is a handy little stunt for dividing a seven-inch board in eight strips of equal width in a quick and accurate manner. First place "0" inches on the rule at point "A" on the board at the left hand side, then draw the right hand edge downward to the eight-inch mark. Next mark off the distances at figures 1, 2, 3, etc., as illustrated in the drawing at the left. Then do the same thing at the bottom of the board, and connect the marks with a ruled line, and you are ready to rip the board in short order.—J. F. Hotch.

Handy Stunt to Mark Screw Holes for Hinges



WHEN mounting a lid with hinges on a chest or box, specially made studs or short screws may be used to mark the position of the screws to be placed in the lid. The hinges are mounted on the box or chest and then folded over with the studs in place as shown. The lid is then put in exact position and pressure applied from the top. The studs then act as so many center punches to indicate the positions of the screw holes.—Lester P. Young.

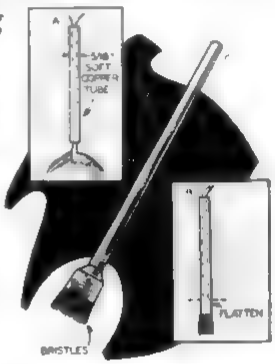
A Page of Ideas for Handymen

Chicken Feed Trough Made from Gas Tank Prevents Waste

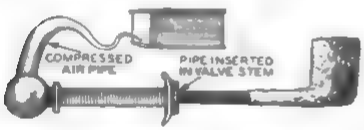
HERE is the way to make an old auto gas tank serve as a handy feed trough for chickens. An opening should first be cut into one end of the tank, as shown in the illustration at the left, and the side dented with a hammer in the form of a "V." The other end should then be cut out entirely.

The tank is then set on its end and filled with oyster shell. Placed in a convenient place in the hen-house, this container will hold enough feed to last for several weeks. As the hens feed, the tank empties, and no grit is wasted.—G. Brinkman.

Handy Brush for Soldering



IN tin shops where acids are used for soldering, a brush is usually found to be the most efficient tool for applying the solution. A suitable brush can be made by threading a 5/16 inch copper tube with a piece of wire to pull up in the tube a wisp of thin bristles. With these bristles in place, flatten out the tube to secure them tightly.—W. B. Spray.

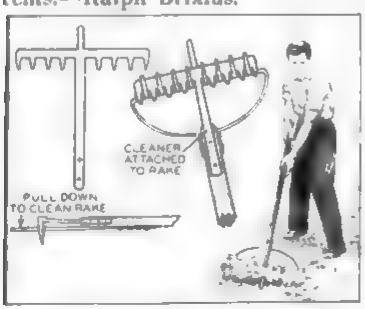


Quick, Easy Method to Clean Pipe Stems

TO CLEAN out your pipe quickly and thoroughly insert the mouth piece in a valve stem attached to a compressed air pipe as shown here.—George Parker.

Skate and Vise Make Holder to Cut Cost of Shoe Shines

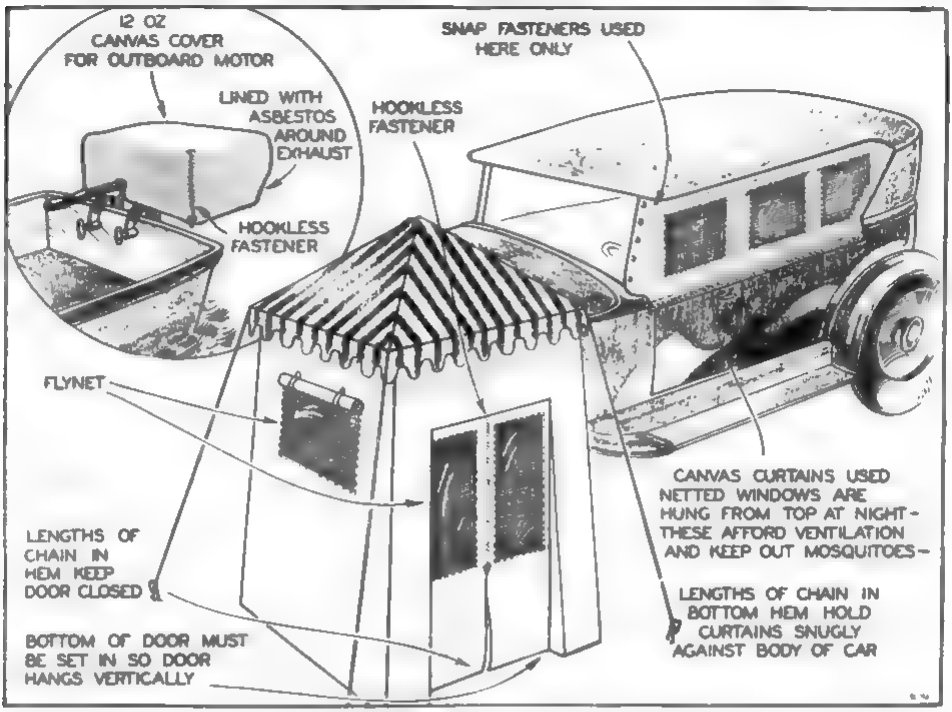
HERE is a handy little stunt for the man who shines his own shoes. Take an old pair of ice skates, fasten the shoes to the skates, and put the skate in the vise of the home workshop. Put a pair of shoe trees in the shoes before beginning the operation, and in a few minutes, with a little elbow grease, you can have a better shine for about one cent than you can buy from the average bootblack for ten or fifteen cents.—Ralph Brixius.



Labor Saving Stunt to Clean Rakes

CLEANING a rake every few minutes is usually an exasperating task, but this can be avoided by equipping your rake with a movable set of extra teeth, as illustrated in the accompanying drawing. These extra teeth are made from a piece of spring steel moulded to the shape shown in the drawing at the left. A simple downward push of the handle cleans the rake instantly.—Roy Balken.

Helpful Stunts for Motor-Campers

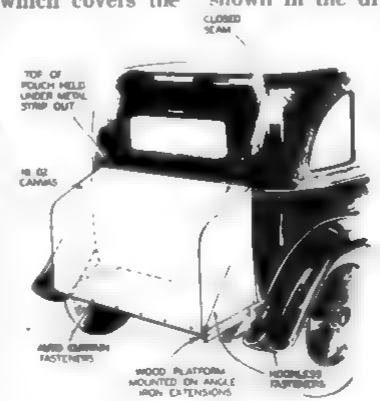


Above drawings show the various ways in which canvas equipped with zippers can aid outdoor fans.

THE use of canvas and hookless fasteners at a number of places in camping equipment will add immensely to the comfort of motor-campers, boating enthusiasts—in fact, of all outdoor fans. One place in particular where these two articles will prove extremely convenient is in tent doors. Usually the entrance of an umbrella tent can be closed only by unrolling a long flap which covers the doorway. A much better door can be made by hanging two canvas curtains over the door, each with a panel of mosquito netting. As the umbrella tent slopes slightly, it will be necessary to set the bottom of the door in a short space. The upper part of the door is held together with hookless fasteners, which can be purchased or taken from a pair of old overalls or a workshirt. A chain sewed in the hem at the bottom of each flap will serve to keep the lower parts of the curtains together.

Canvas equipped with hookless fasteners also makes a very handy cover for a motor boat engine that can be quickly removed. The canvas is sewed for the purpose in the manner illustrated in the drawing above.

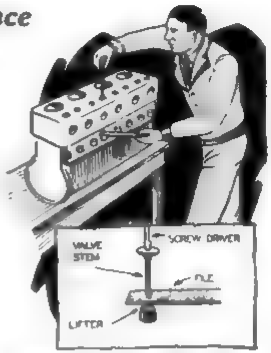
A luggage carrier made from canvas as shown in the drawing below will be found very useful for motor-campers. Made of 16 oz. canvas, and sewed as illustrated, the carrier is mounted on a wooden platform supported on the rear of the car by extending the frame with lengths of 1½-inch by 1½-inch angle iron. The novel feature of the carrier is the use of hookless fasteners at slits in the sides, which permits the pouch to be opened wide at a moment's notice. —Dick Cole.

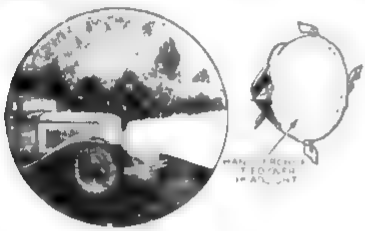


Items of Interest to Motorists

How to File Ford Valve Stem to Give Proper Clearance

IF YOU have on hand the task of filing off a valve stem to give it the proper amount of clearance, you will find this little stunt a satisfactory way of doing the job. After the valve spring has been removed, place a file on top of the lifter and set the valve to be cut into its proper guide, seating the valve on top of the file, as illustrated at the right. Then with a screw driver or valve grinding tool, turn the valve with plenty of pressure. This will cut the end of the stem to a perfect flat surface.—W. E. Beebe.



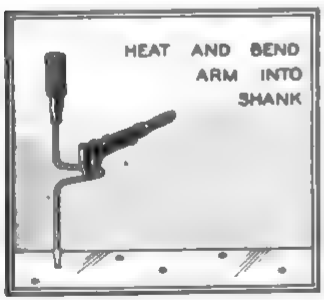


Cloth on Light Aids Driving in Fog

THE difficulty of driving at night in a heavy fog can be reduced considerably by simply tying a linen handkerchief over the headlights, as illustrated at the left. First tie three knots in the corners of the handkerchief, then draw it over the light and tie the fourth knot. –S. W. Aitman.

Lubrication Nipple on Wheel Hub Convenient for Greasing

AFTER a hub cap on an auto wheel has been removed several times to lubricate the bearing, the threads become worn, necessitating the purchase of a new cap. This difficulty can be avoided by fitting the caps with lubrication nipples, which are bolted to the cap in the manner shown in the drawing at the right. The threaded end is filed down to take a very thin nut, the hub cap is then drilled, and the nipple set in place. The grease put in through this nipple goes home where it is needed for correct lubrication of the wheels.—John Edwin Hogg.

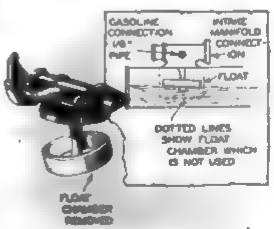


Bent Shanks on Tools Aid Removal of Screws

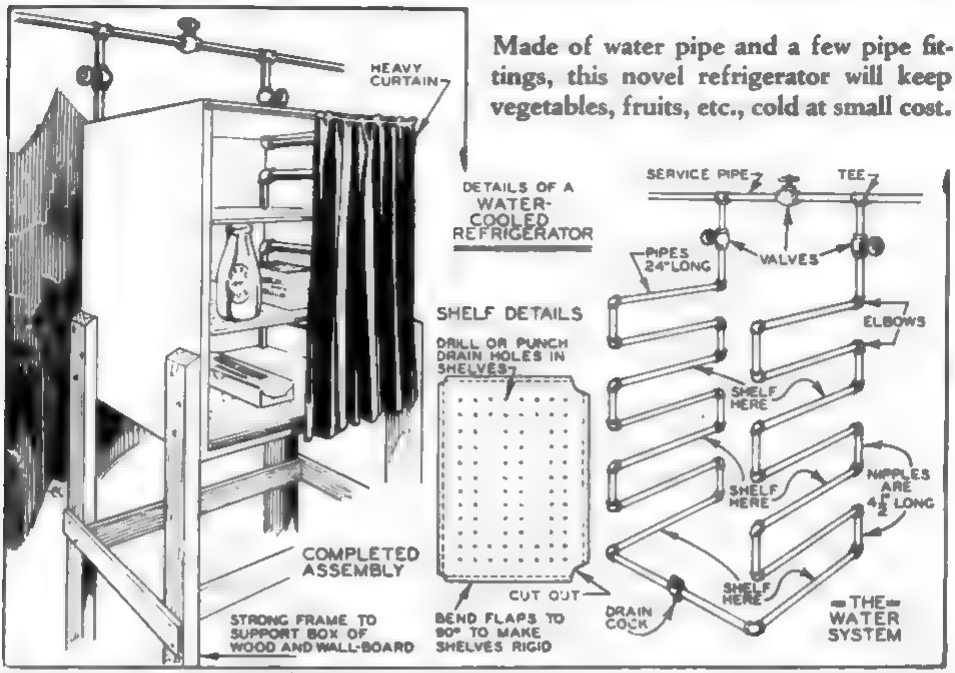
GETTING at inaccessible nuts and screws often proves a trying task to auto mechanics, causing waste of time and effort. And when the screws or nuts are stuck, the task of removing them is doubly difficult. An excellent way to fix your screw driver or socket wrench to take care of these situations is to bend a shank or arm in the handle of your tools. This is done by heating the tool over the fire, then bending it into a shank as illustrated in the accompanying drawing. By gripping the arm with a monkey wrench the tight nut or screw can be removed easily. —T. A. Allen.

Old Ford Carburetor Makes Efficient Float Valve

WHERE a small float valve is needed to regulate the height of liquid in a tank of any kind, an old carburetor of the type used on Ford Model "T" cars may be used. The float chamber is removed, leaving the float open to operate on top of the water. The supply line is connected to the ¼ in. pipe connection after the brass elbow of the gas line has been removed. Rigidity of the pipe supports the valve.—W. T. Clayton, Jr.



Novel Refrigerator Cooled by Water

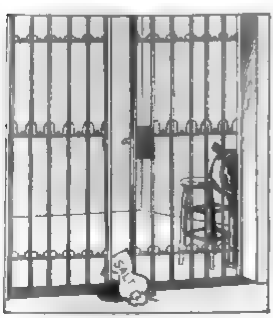


Made of water pipe and a few pipe fittings, this novel refrigerator will keep vegetables, fruits, etc., cold at small cost.

Shelves for the water cooled refrigerator are supported by pipes connected to main pipe line as shown.

IN ANY house supplied by city water, the ice bill can be greatly reduced by using this water-cooled refrigerator, made simply from pipes, a few elbows and valves. Installed in the basement where the pipes are always cool, such a novel refrigerator will easily keep all foods cold enough to prevent spoiling.

The refrigerator is composed of pieces of ¾ in. galvanized pipe connected with elbows and 4½ in. nipples in the manner illustrated in the drawings above. The bottom piece of pipe should come at the front, and the top pieces are connected to the main line through valves as shown.



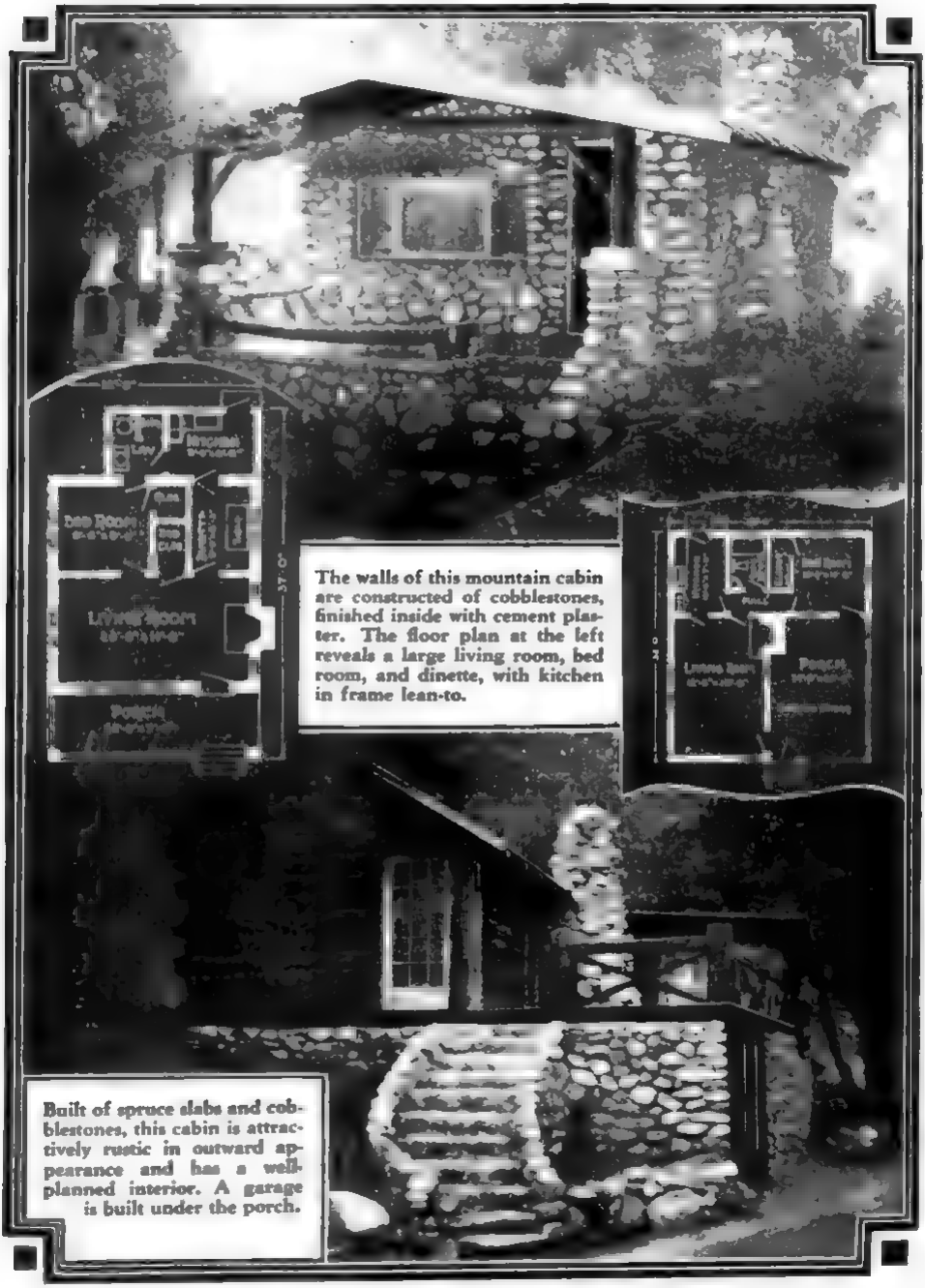
Have a tinsmith make three shelves of heavy sheet iron drilled full of holes, and with the ends bent down to fit over the corresponding pipes on each side. One shelf goes at the bottom, the next on two pipes above it, and the last on the two pipes above that one. White lead should be used in all pipe joints, and all bare iron painted with enamel or some rust-resisting paint.

When connected up the cooler will appear as in the above sketches. Make a box-like enclosure for it out of wall board that will enclose the back, sides and top, and arrange a cloth curtain on a wire from the front. The cooling properties are obtained by shutting the valve in the main line and opening the two valves in the vertical pipes. This sidetracks the water used in the house through the cooling sections.—George Bohm.

Sand-filled Bag Keeps Elevator Door Open

TO SOLVE the problem of keeping the gates of an elevator open when it is unoccupied, take a five-pound bag of the type used to hold salt and fill it with sand. With the top sewed up, the bag makes a handy wedge that cannot easily be lost. You can carry the bag just behind the door, where it will always be handy for use.—Andrew Mosley.

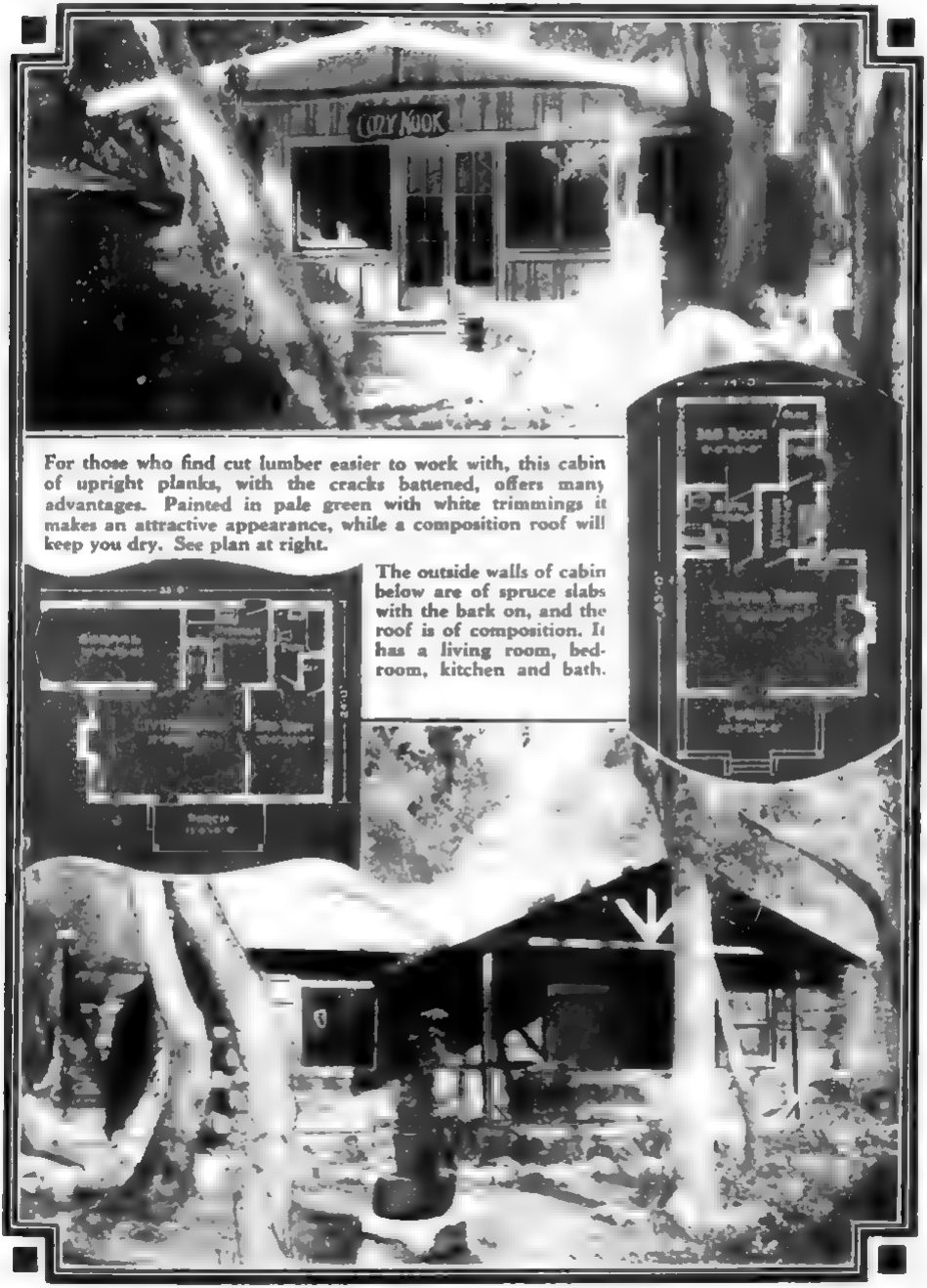
Easy-to-Build CABINS



The walls of this mountain cabin are constructed of cobblestones, finished inside with cement plaster. The floor plan at the left reveals a large living room, bed room, and dinette, with kitchen in frame lean-to.

Built of spruce slabs and cobblestones, this cabin is attractively rustic in outward appearance and has a well-planned interior. A garage is built under the porch.

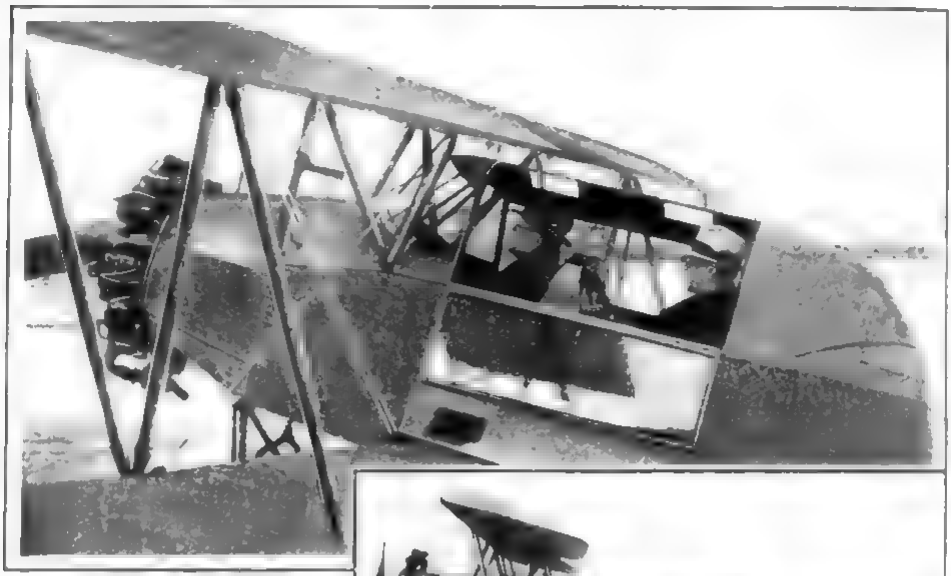
for the Summer CAMP



For those who find cut lumber easier to work with, this cabin of upright planks, with the cracks battened, offers many advantages. Painted in pale green with white trimmings it makes an attractive appearance, while a composition roof will keep you dry. See plan at right.

The outside walls of cabin below are of spruce slabs with the bark on, and the roof is of composition. It has a living room, bedroom, kitchen and bath.

Open Cockpit and Cabin Are Combined in Same Plane



The Fleet airplane as a cabin job, with one side lowered to show construction. The cabin doesn't vibrate.

The clean lines of the Fleet with cabin removed are shown here.

UNDER Department of Commerce regulations, flying schools are required to give students solo training in both open cockpit and cabin planes. Then again, many private owners desire a plane which will give them both the exhilaration of open flying or the protection of a cabin.

To meet this demand one of the leading aircraft manufacturers has equipped its standard trainer with a demountable cabin enclosure which is completely streamlined.

Opening lengthwise along the top center, the walls of the cabin enclosure fold down on either side of the fuselage, from which position they are quickly detached.

Illustrated Posters Make Taxicabs Very Effective Advertising Medium

Courtesy Automotive Daily News

Photo of taxicab installation of mechanical advertising device.

ONE of the large taxicab companies has recently installed a new automatic advertising device, showing miniature posters in rotation, in all of its vehicles.

The device operates automatically from the motor, is illuminated day and night, and holds over twenty miniature poster advertisements, each of which flashes for eight seconds and is repeated every three minutes. The average cost is three cents per day per cab, costing less than 57 cents per thousand readers.

PLANE TALK

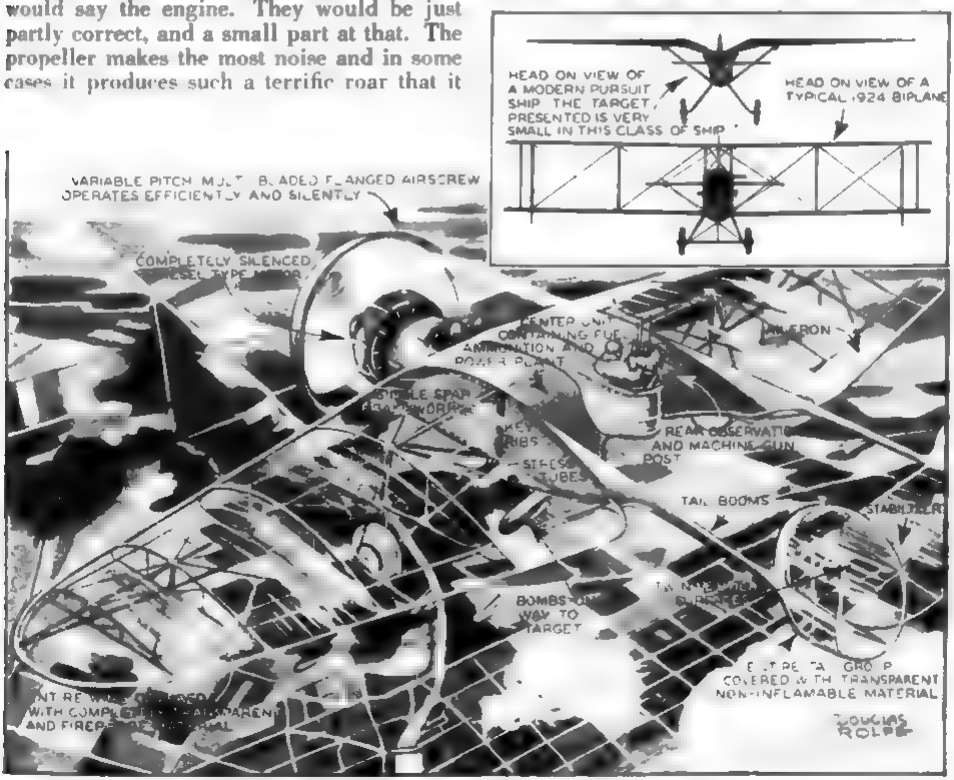
Edited by H. H. ARNOLD

Fighting Planes that Can't be Seen or Heard

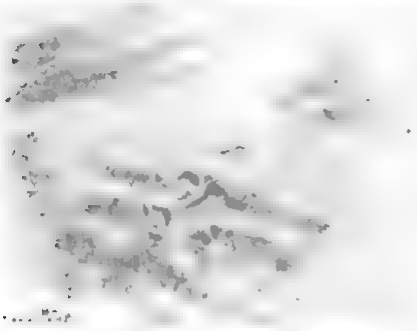
OUT of the sky comes the whine of bombs, a terrific crash and explosion; there follows a period of confusion, havoc and bewilderment for no airplane is in sight and none can be heard. The nearest enemy gun is hundreds of miles away—too far for even a super-gun to reach. From where came that salvo of bombs? Such may be the picture many miles behind the battle front during any future wars. The bombs may be delivered to the target without the planes carrying them being either seen or heard.

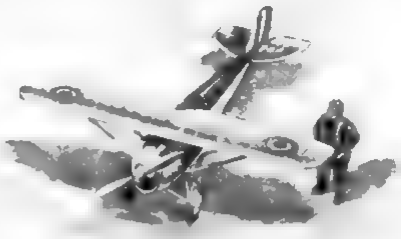
In answering the question as to what part of the plane produces the noise, most people would say the engine. They would be just partly correct, and a small part at that. The propeller makes the most noise and in some cases it produces such a terrific roar that it completely drowns the barks of the engine. Other noises come from stream line wires, projections on the plane and indentations or holes in the surface of the fuselage. When they are all added together, the characteristic noise of each type of plane is produced.

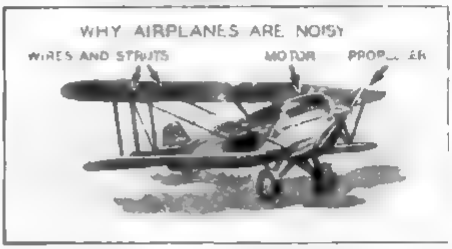
Automobiles have made mufflers for gasoline engines a necessity and there are several types which are applicable to airplanes. However, it is to be noted that the weight of the device is a very important consideration in so far as aircraft are concerned. Then, too, some mufflers absorb more power than others. In aviation there are times when the pilot



Artist's conception of airplane which would be invisible at normal heights. Everything here is now practical except the transparent covering, which is purely a flight of fancy but which may be developed.







Why airplanes are now painted in brilliant colors. At the left is shown how the olive drab Jenny used by the Army on the Mexican border blended with the ground. At the right is a present day plane, its brilliant coloring contrasted with the ground.

Contrary to the general conception, the motor is only a minor cause of the deafening noise produced by an airplane. The propeller, wires, struts and projecting parts are the chief offenders.

needs every bit of power that he can get and then wishes that he had more. However, the airplane engine can be silenced just as efficiently as the automobile engine. As a matter of fact there are several airplane mufflers in use now.

An entirely different problem presents itself with the noise from the propeller. For the first time quite recently this problem has been taken up seriously. The Germans are attempting to solve it by increasing the number of blades and decreasing their size.

Other noises produced by a plane are in general caused by small things which have been ignored. They have not been considered to be of sufficient importance to cause any worry. As a matter of fact they affect the performance of the plane and while each in itself slows up the plane very little, collectively they may take off several miles an hour. Projections on or indentations in the fuselage produce a whine, whistle, screech or roar that is deafening under certain conditions. Stream line wires emit an ear breaking screech when they are driven through the air at certain angles. All of these noises can be eliminated with a few tests and some study and as the noise decreases the speed of the airplane will probably increase.

While the noiseless airplane may soon be here, the invisible plane is farther away. Military experts have long been experimenting with various materials and colors in their endeavors to produce a plane which, if not entirely invisible, will at least be hard to pick up in the air. For a while it looked as if some of the cellulose concoctions could be used to cover the wings and fuselage and thus make them transparent.

Attempts were made to secure color schemes that made the plane blend with the sky. However, the colors in the sky are not always the same for the clear sky is a shade of blue while the clouds vary from a white to a terrifying black. Thus while a color scheme may be found that will make the plane harder to see it is very doubtful if colors will be able to do the trick by themselves. However, colors will help. The U. S. Army airplanes used to be painted an olive drab. For a while we had an epidemic of lost planes. The search parties soon found that the olive drab planes blended so well with the ground that it was practically impossible to find them from the air. Then it was that the brilliant yellow wings were adopted. Now the planes can be seen for miles.

Enormous strides have been made toward securing invisible airplanes without special endeavors during the natural development of airplanes. In the quest for increased speed, the surface of airplanes has been smoothed out, parts have been stream lined, and the strength of wings increased so that struts and wires can be eliminated. This has resulted in planes being produced that are hard to see at any considerable distance.

United States Army Adopts Rear View Mirror for Planes

IT IS not always that an airplane pilot wants to see backward but when he does, he twists and turns and wishes that he had a neck like a bird. As early as 1911 designers were groping for anything that would make flying safer and more popular. It was then that the idea of the rear view mirror was first suggested. Again during the World war some of the famous aces realized that it would provide a means to prevent surprise from the rear. These aerial warriors became mighty tired from constantly turning and twisting to scan the sky behind them. The heavy, cumbersome flying suits they wore made observation to the rear almost impossible.

Today mirrors are installed as standard equipment on Army training planes and it is possible for instructors and students to see the rear without effort. This is very important at aviation schools where there is constant danger of collisions on account of the great number of planes in the air. As soon as a pilot gets a little careless two planes are almost sure to run into one another.

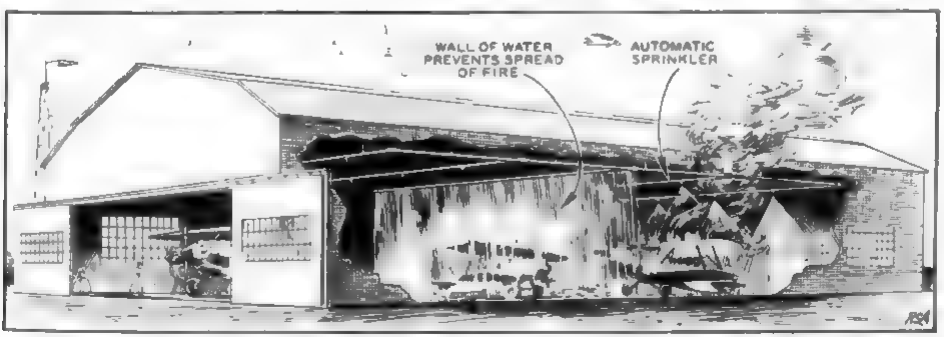
How the rear view mirror is attached to the wing above the cockpit, enabling the pilot to see planes approaching from behind. The inset shows how a formation flight would appear to the leader.

Hangar Fires Restricted by Curtains of Falling Water and Sprinklers

IT HAS been found that the water falling on burning airplanes will not spread the fire by floating away burning gasoline. As a matter of fact a sprinkler system actually put out a fire when there were over 60 gallons of gasoline left in the tank. This fire was extinguished even though the heat from the fire had made a long split in the top of the tank.

Heretofore it has been a generally accepted principle that when a hangar catches fire it was a waste of time to try to save the planes.

It also has been found that curtains of water will cut off and isolate fire in one part of a hangar. Thus other parts can be worked in without suffering from the heat or danger of the fire while removing equipment. The water falling keeps the fire from damaging to any extent the walls of the hangar. Thus it looks as if science has found a way to restrict a fire in a hangar to a very small space and by placing a wall of water around the area, limit the damage done to a minimum. Thus the horror and nightmare of fires in airplane hangars should be no more.



Cutaway view of a typical hangar, showing how fire can be isolated by water curtains and extinguished by sprinklers. In actual tests flames arose 200 feet but the hangar was not greatly damaged.

Build "Punkin Seed"

by JIM DAWSON

Among the most thrilling of sports, outboard racing has rapidly come to the fore in recent years. Here are complete plans for a little outboard hydroplane which is easy to build and which will get up and step with the best of them. "Punkin Seed" is a big time racing boat in every respect.

THIS little boat, called *Punkin Seed* because she resembles a flat, skittering pumpkin seed very much, is a fast little boat. She is just a little over twelve feet long, and she is but 44 inches wide, yet she can travel at a rate of speed of over forty miles an hour. The pictures accompanying this article show her running at better than the forty mile mark.

She was designed expressly as an out and out racing machine for the heavier outboards. She will handle a C, D, or F job without difficulty. The motor shown in the photographs is a Johnson 32 of the 1930 crop, and with this machine the little boat had small difficulty in pushing Ray Pregenzer, famous outboard racer and outboard champion, to the limit at the start of the season at Fox Lake, Wis., last year.

In action the boat is very stable, though of course she is somewhat light on her feet as are all of these highly-powered, lightly-built boats.

The concavity on her bottom is designed to give a controlling keel surface when turning. Of course a fin must be used and as every boat is different, no matter if built to the same set of plans, only experiment can

From top to bottom are shown the clean-cut lines of "Punkin Seed's" bow, the gas throttle extension placed handy to the steering wheel, the proper method of installing the powerful power-plant on the tiny hydroplane, and the racy lines of the profile. Note the perfect streamlining of the craft.

a Fast Outboard Racer

"Punkin Seed," with the designer at the wheel, skimming over the waters of Lake Minnetonka, at 40 per.

tell you what is the best fin to use. We found a small one three inches deep and fourteen inches long with rounded corners was the best when placed six inches forward of the step.

Let's start her building operations with the first step taken in the right direction. Get a long sheet of brown building paper large enough to hold the drawings as shown in the accompanying blue print. We are to lay down the drawing shown there to full size, fairing up the lines so that there are no bumps in them.

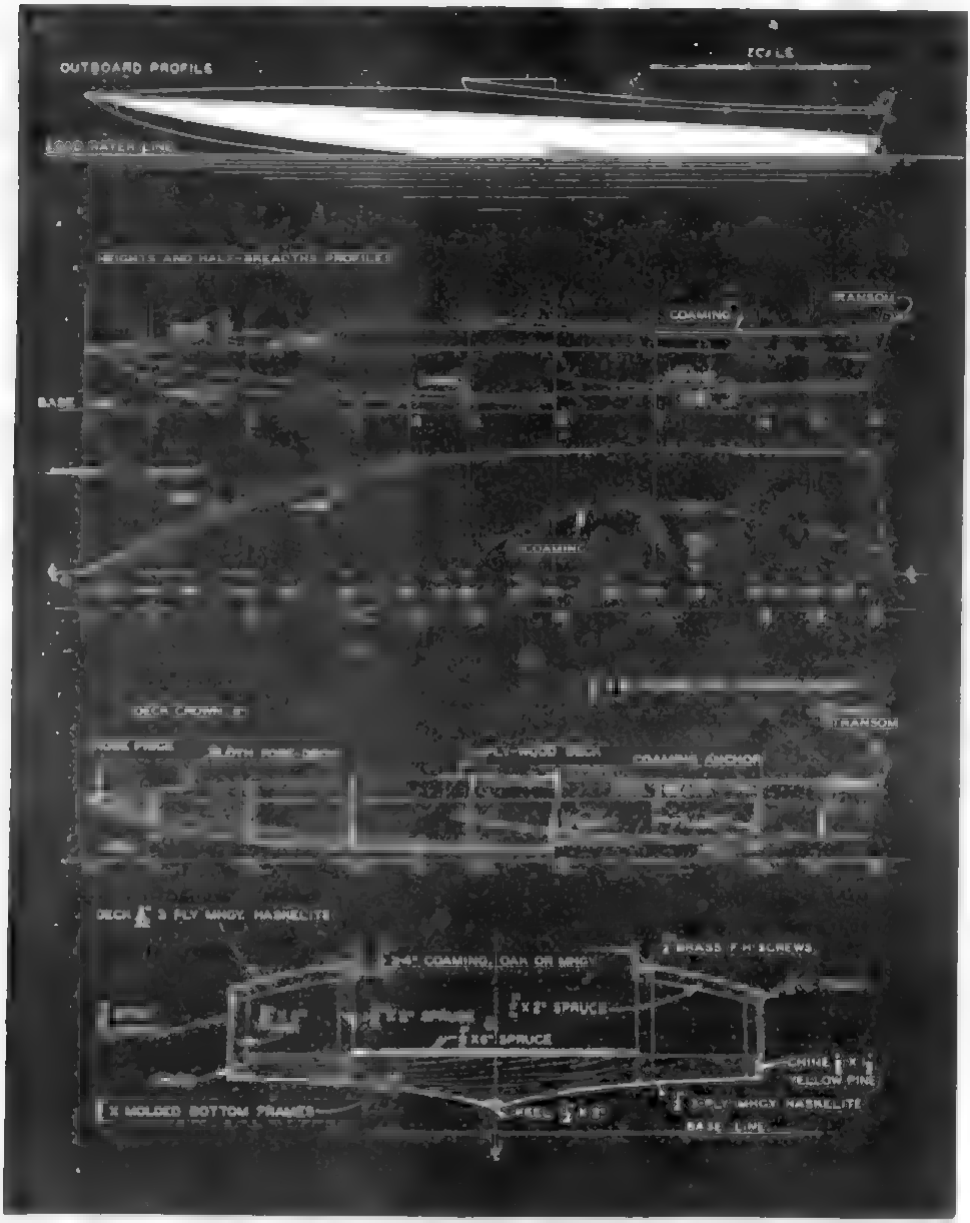
With battens about half an inch square we set in the curves after the square lines like the center lines and the station lines, 0, 1, 2, 3, 4, and so on have been erected at their proper spacings from the stem.

From the offset table given at the last of this article the half breadth dimensions are laid out. The table reads 1-11-0 and since it is made to read in feet, inches and eighths of an inch, the figure 1-11-0, or any of the other figures in the table are interpreted to read 1 foot, 11 inches, and no eighths. If the table says 1-1-4 then we mark out from the center line 1 foot, 1 inch and 4/8ths of an inch, which is equal to half an inch.

After all the half breadth dimensions are laid down in points along the station lines, measuring out from the center line just like the drawing shown in the blue print, the batten is tacked down. Before a line is drawn, however, it will be found that in spite of how carefully you place the dimensional spots, the batten along the chine line or

BLUEPRINTS FOR "PUNKIN SEED"

If you are contemplating building "Punkin Seed" and would like a set of blueprints from the designer's original drawings (similar to those reproduced on page 124, but done up in larger size for shop use) you can obtain them for 75c from Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn.



The simple but complete plans for building "Punkin Seed." These lines should be laid out full size.

along the deck line on these half breadths will not go through all the spots.

It is our job in the fairing of the boat to make the batten come as close to going through all the spots as we can. So we adjust the batten to pass through the majority of the marks, using the mark at station No. 7 as a base point, and when the batten is fair and has no curves or humps in it we draw our line. This is what boatbuilders call "fairing" a set of lines. It has to be done in all designs, even the largest ocean liners.

With her 32 horsepower motor opened all the way, she lifts herself almost entirely clear of the water.

You see the plans of the boat are drawn to a scale of ¾ inch to the foot in their original size, and the drawing you make full size on the floor is sixteen times as large as the original. If the draughtsman makes a mistake of just one eighth of an inch on reading his hair line scale with which he scales off the dimensions you find in the offset table, the mistake is multiplied sixteen times in the full size drawing. If you attempted to build the boat without first fairing her up you would have all the material cut and the frames made before finding it out, so you can see why it is best to fair the boat up, and do your building from the full sized drawing.

With the half breadths faired, it is necessary to make the profile lines to full size. Then you have two views which are checked by making a body or cross sectional plan. It is not shown herewith as it is not necessary. The curve shown in the bottom as in the cross sectional construction view is carried along throughout the design, and is of constant curve. A body plan in cross section must be made from the half breadths drawing and from the profile drawing so you will be able to make the frames.

Now with the drawings made full size the boat is ready for building as far as the carpentry is concerned.

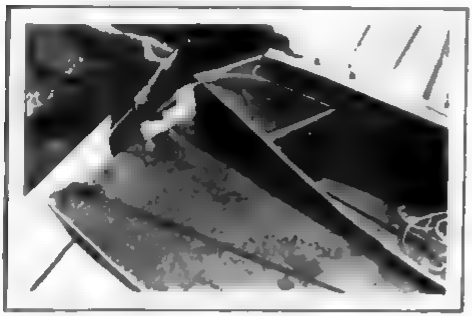
You will want to get a couple of good strong sawhorses and put two 4x4's across them at about an 8 foot gap for a back bone. This will serve as a floor for fastening frames while the keel is put in. The frames are tied across their tops at the deck line with some temporary material and are laid bottom up, transversely across this backbone of false work at the intervals shown by the station markings on the drawing.

Then the keel is put in.

This is a slim stick of white oak 1¼x1½" laid into the frames the flat way. It is let into the frames far enough so that the planking which is ¼ inch haskelite plywood, can be rabbetted so as to come flush with the bottom of the keel. See the cross sectional detail showing how the planking and the keel are fastened.

The keel forward is put in last. Commence with the short piece in the aft portion of the boat. Let the keel into the double frame at the step. Then run it through the frames No. 7, 8 and 9 and into the transom. Brass screws 2" long, one to a frame, will hold the keel to the frames.

Then the front keel will have to be soaked in hot water for an hour or two. The mortised socket for the forward end will have already been prepared out of a piece of spruce and anchored by a cross piece, false, to the 4x4 backbone. Then with the other frames boxed out for the keel, it can be bent back and fastened to the step.



This photo shows the transom, the steering cables and the throttle control extension. Snap hooks make these controls quickly detachable.

The same kind of fastenings for the forward keel are used as in the back.

With the frames erected and the transom and step frames in, the chine pieces are bent in and anchored to the bow partner, or breasthook as such an anchorage is termed.

It is best when bending the chines to have the transom notched and ready, and the two strips ready to bend at the same time. This avoids the danger of possibly bending the frame out of line, which is apt to occur when one side is done before the other.

When the keel and chines are in the boat, and they have been allowed to dry out thoroughly, and when all the screws have been sunk so that no heads protrude, the side planks are put on. These are of half inch mahogany. They are molded for depth according to the side lines as shown on the profile plan of the chines. It is best to bend them from the step frame six aft, and fasten them, and then bend them together toward the partner or breasthook at the bow.

Of course the planks are fastened to the frame and chines as you work them forward.

A good hint on the way to bend the planks around to the bow piece is not out of place at this time. If the planks are planed to taper in thickness from station six forward so that they are about ¼ inch thick at the bow, and then if the flat machined surface is put *inside* next to the frames, and if the ends of the pieces are wrapped in rags and drenched with many kettles full of hot water they will work right into place like wax. Care must be used in fastening, because a split plank will give trouble in later use. Not so good to have a plank open up at a time when that old trophy is right in sight around the next turn in the course!

The bottom is made of four sheets of ¼ inch haskelite. This haskelite has no substitute. Generally, and for a boat that is left in the water continuously it is not serviceable unless the edges can be impregnated with a waterproofing material. But in a boat like this, where it is hauled out after every race, it is ideal because it so strong. Or in canoes, where the ends of the wood are out of water, it is splendid.

The plywood can be softened sufficiently for bending by pouring boiling water on it. It can then be pressed into shape on the frames and fastened down with No. 6¾" brass screws. Space these screws as closely as need be. Never use nails—they won't hold. If the screws are close enough together the wood will bend down. That is the test.

Put a good grade of canoe glue, such as Jeffery's "C" quality, along the edges of the chine and transom and in the rabbet or notch in the keel. This will not only help preserve the plywood but it will also keep the boat tight from irregularities in building. Boats built of plywood will not swell up and stay tight like wooden boats.

Of course, if you want a service boat more than a racer, there is nothing in the world to stop you from putting about 5/16 inch hard mahogany planking on the bottom and

(Continued on page 200)

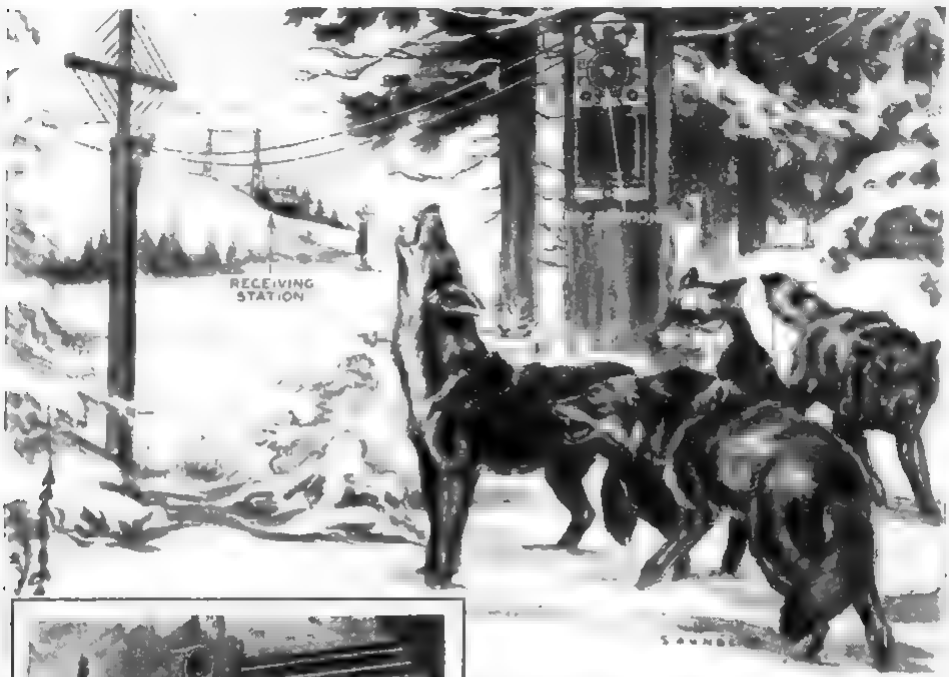
TABLE OF OFFSETS
HALF BREADTHS

Item	Sta.	0	1	2	3	4	5	6	7	8	9	10
SHEER			0-6-0	1-1-4	1-6-4	1-8-5	1-10-0	1-11-0	1-11-0	1-10-7	1-10-6	1-10-4
CHINE			0-5-1	1-0-2	1-6-0	1-8-2	1- 9-7	1-11-0	1-11-0	1-11-0	1-11-0	1-11-0

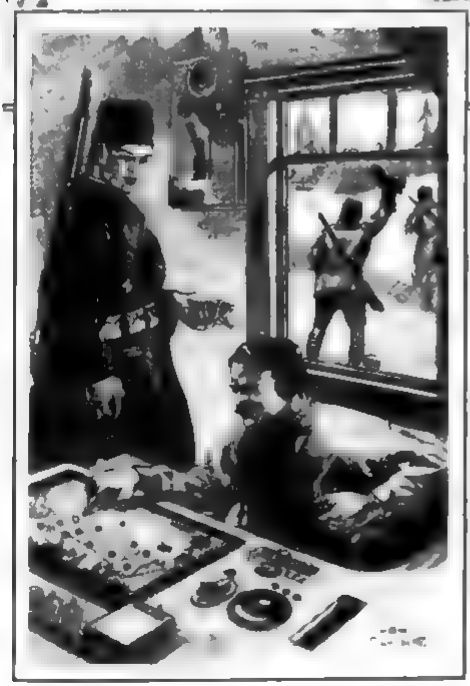
HEIGHTS ABOVE BASE

KEEL	. . . .	0-11-5	0-6-5	0-3-6	0-2-6	0-2-4	0- 2-1	0- 2-0				
							STEP	0- 3-3	0- 3-6	0- 4-0	0- 4-2	0- 4-4
CHINE	. . . . .	0-11-5	0-9-3	0-6-6	0-4-4	0-3-5	0- 3-2	0- 3-0				
							STEP	0- 6-6	0- 4-7	0- 5-1	0- 5-2	0- 5-3
SHEER		0-11-5	<———	———	———	———	Straight	———>	0-11-3	0-11-2	0-11-0	0-10-6

Radiophone to Rid Siberia of Wolves



In the latest scheme to rid Siberia of wolves, the packs will be located by means of radiophones mounted on trees to pick up the howls and flash them by short wave radio to "central" station.



When wolf packs have been located over radiophone at central station a patrol of volunteer hunters will be dispatched to exterminate the animals.

RADIO telephones placed at intervals throughout the wolf-infested regions of Siberia so that the whereabouts of these dangerous pests can be easily discovered is the latest means proposed by Soviet officials to rid the vast plains of the country of the wolf menace, long an obstacle to settlement and safe travel. These radiophones will be set up on posts and trees and will flash the howl of wolves by short wave wireless to a central station, thus indicating the presence of these animals within the radius of some station, so that a patrol of hunters can be dispatched immediately to the spot to exterminate the pack.

Howls of wolves running in packs are often audible for several miles over the silent Siberian plains, and as there are scarcely any interfering noises the radiophone system will have no difficulty in revealing the whereabouts of wolf pests.

Bureau-Shaped Building Houses Bureau of Information

This unique building, resembling huge bureau, advertises town's furniture industry, and serves as Chamber of Commerce's information bureau.

AS a novel means of advertising their town's chief industry, the manufacture of furniture, the local Chamber of Commerce of High Point, N. C., has erected a building resembling a huge bureau to house its headquarters. The novelty of the structure lies in the sign on the mirror, for the building is actually a bureau—a bureau of information. This unique building was erected by popular subscription and is located in the heart of the town.

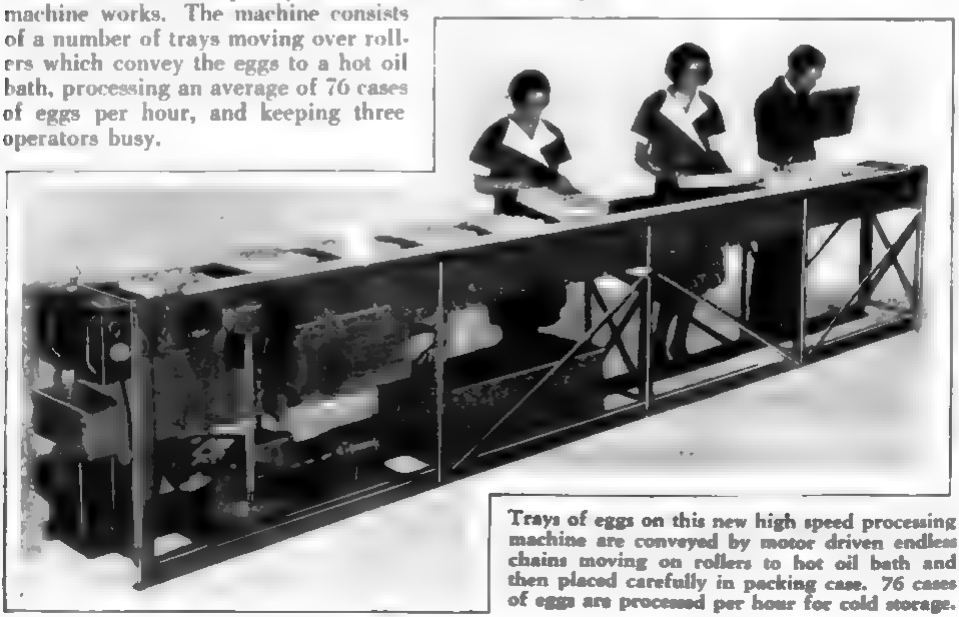
How 'Fiddler Crabs' Threaten Foes

A NEW explanation of why the "fiddler crabs" of the East Indies wave one claw almost continuously in the air like a violinist flourishing his bow is given by an eminent Dutch biologist. The gesture, he believes, is one of possession and defiance, intended to warn other crabs to keep their distance and leave to the claw waver undisputed possession of his own special patch of seashore slime.

The fiddling habit is not universal among the crabs of the mangrove swamps but is confined to a few species which live habitually in crowded communities. Under these circumstances the crabs develop a sense of individual ownership and try to keep off possible invaders by the continual display of the menacing claw.

New Egg Processing Machine

A NEW machine, original in design and operation, for the processing of eggs for preservation in cold storage for as long as a year has been developed by a San Francisco machine works. The machine consists of a number of trays moving over rollers which convey the eggs to a hot oil bath, processing an average of 76 cases of eggs per hour, and keeping three operators busy.



Trays of eggs on this new high speed processing machine are conveyed by motor driven endless chains moving on rollers to hot oil bath and then placed carefully in packing case. 76 cases of eggs are processed per hour for cold storage.

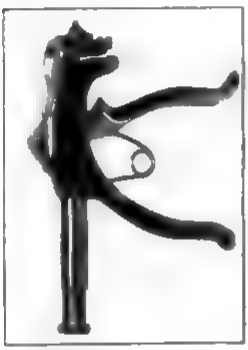
Practice Target Aids Baseball Pitcher's Control of Curve

J. F. STAUFFER of Tutwiler, Miss., has recently invented a target which will enable a manager or coach to get a line on the real ability of his pitchers, insofar as control is concerned, or will enable the player himself to practice and retain his control during the off-season.

The device consists of a padded screen marked off in squares corresponding to the spots at which the pitcher would aim upon receiving signals from his catcher. A full size dummy player is erected in front of the screen in the position the batter would normally assume.

The dummy batsman may be placed on either side of the plate during control practice by pitchers.

A Handy New Saw Hammer Set



This device is said to be the only hammer and anvil pistol grip saw set.

AN ingenious new type of saw set has been developed by a Minneapolis manufacturer, which is so compact that it can easily be carried about in the tool box.

The device has a real hammer and anvil action. A light pressure on the trigger draws the hammer against the spring which is compressed and then released by a small dog, the hammer striking the saw a sharp blow. The result is a perfect uniform set, regardless of whether the saw has soft or hard spots.

Auto-Boat Speedy on Land or Sea

YOU may take your choice and call it a sea-going auto or a road-boat, but whatever it is, the vehicle shown in the photo below performs nicely on land or water, developing 25 miles an hour in the liquid element and 40 per on terra firma.

The land-boat (or sea-auto) was invented by Peter Prell of Union, New Jersey, presumably for the purpose of beating the jam on both tube and ferry while commuting to New York.

Peter Prell, of Union City, New Jersey, is shown above in his water-land craft which skims over water or land with equal facility. This photograph was taken on its test run in the Hudson River recently.

Africa is 60 Miles from

by JAMES BOWLES

If you think the title of this article is rather far-fetched, you're doing an injustice to Hollywood's cleverest location managers, whose special brand of geography, not taught in the public schools, crowds Alaska, Ireland, Honolulu and Holland within the bounds of the state of California.

This scene represents tropical Africa, to the camera. Actually the pool is artificial and the palm trees planted on a Warner Bros. set in California.

FRANCE is 20 miles from the South Seas. the Sahara Desert adjoins Holtville. California, and the dykes of Holland leak into Long Beach.

Crazy geography? Not a bit of it. It may not be according to conventional maps, but it suits the producers of movies with foreign settings. And as far as the talkies are concerned, the Steppes of Russia are only 40 miles from Hollywood and the haunts of cannibal head-hunters even closer than that.

Of course, these bits of foreign countries are used for movie purposes only. Politically, they're part of the state of California. In the office of Fred Harris, locations manager for Paramount, there are 35,000 photographs of settings which can be used in representing foreign scenes.

A company actually shooting a foreign film abroad encounters too many difficulties in most instances to make the venture worth while. The absence of high voltage electrical lines and enormous costs of transportation and salaries make it advisable to use such California locations—and there are more than 35,000 of them—as are available.

In California every foreign scene—from the snow clad Alps to the jungles of South Africa—can be reproduced, with one exception: the rivers run upside down. That is not literally true, of course, but so many streams run underground around Hollywood that location managers often are driven frantic searching for streams that can be made to look the counterpart of others on the other side of the world.

A few of the 35,000 photographs of settings used by a location manager in advising cameramen and directors where foreign localities can be reproduced.

From Hollywood one need travel only 60 miles to reach Africa, 90 miles to Alaska, 45 miles to the Canadian coast, 37 miles to reach English hills, 15 miles to the French Riviera, 35 miles to Holland, 37 miles to the hills of Ireland, 45 miles to Italian lake resorts, 35 miles to the Mexican coast and 45 miles to Tripoli. Oddly, midwestern towns near So-

Hollywood (in the Movies)

Devil's Island, the French penal colony, is here reconstructed on the southern California coast. The street is an exact duplicate in every way of the real one on the island.

This scene from "Disraeli," representing an English garden setting, was filmed in the famous Busch gardens at Pasadena, Calif.

nora, 600 miles distant, are further from Hollywood than Siberia, 500 miles away at Truckee.

Victorville, in San Bernardino county, probably has been the background for as many exterior movie scenes as any other city in the world. Without moving the cameras other than to turn them around, there may be recorded on celluloid vistas of green fields, a river bordered with densely growing trees, and desert with drifting sands and sage brush and Joshua trees (desert palms). Nearby, the same cameras may record dry lakes and pyramid-like buttes which give an Egyptian touch, and valleys bordered by towering mountains. During the winter Alpine snow scenes are available.

But how are these locations found?

Suppose a studio should decide on a picture with the locale to be laid in France. An assistant director calls the location manager.

"This is Bill Blank speaking. George. We must have a French location next Monday: the French Riviera. What have you close by?"

This is an easy one for the location manager, who will reply, "French Riviera is 30 minutes from the studio at the Santa Monica palisades. Good bye".

Another phone rings. A second assistant-director wants exteriors on the Sahara desert, and the location manager sends him to the Imperial Valley.

Another assistant director wants the locale in the South Seas. He is directed to the isthmus on Catalina Island, or the crescent-curved, rock-bound Laguna beach.

In Hollywood and on nearby locations

These South Sea head-hunters are savage Hollywood extras, touched up with grease paint and reclining on the beach at Catalina Island, California.

Sound trucks and equipment which would cost a fortune to ship to foreign settings are saved these journeys when locations are chosen near home.

pageants of all nations and all times are produced. Recently on two movie "ranches"—so called only because they were large areas of land outside the city—I witnessed the filming of a street battle during the French revolution, and of a Chinese town hard by a river bank. In both cases from the "camera angle" along side the cameraman I could see the hills of North Hollywood forming the skyline behind the scenes.

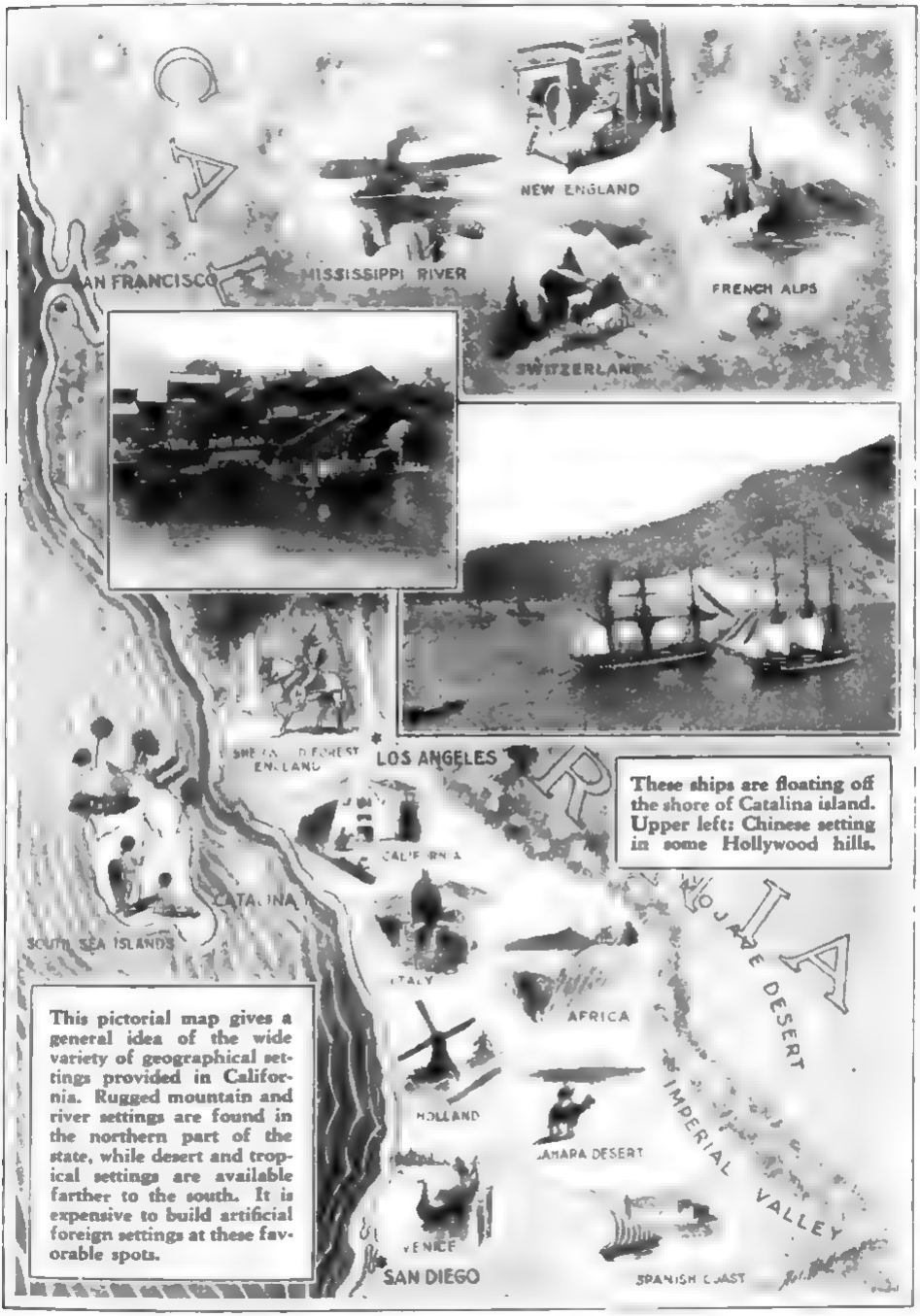
As the "shooting" of the Chinese pictures continued, on a nearby set, perched on the dry branches of a papier-mache tree, a sparrow warbled its greetings to the spring.

Without painstaking research, no foreign picture of consequence could be filmed in California; and without much greater expense than the run-of-the-mill picture warrants, a company cannot be carried to a foreign country. Therefore, research specialists, writers, photographers, and, in some cases, engineers visit foreign scenes and record in picture and drawing those scenes to be reproduced.

In preparing for the "Call of the Flesh" a scenarist spent six months in Spain, gathering atmospheric material—and searching for a Spanish police-patrol of about eighty years ago. When it finally was located, the patrol proved to be a small one-horse wagon with a simple iron cage on top. But the vehicle belonged to a museum and could not be sent to Hollywood. So the scenarist made exact measurements, sketched the patrol from various angles and wrote a complete description so it could be reproduced. Later, when it was shown in the Seville market place none could have distinguished it from the original.

Research staffs of the studios not only must pass on the California scene where the picture is to be filmed, but must decide upon the authenticity of every prop and setting to be used. They even censor the dialogue and music in order that nothing will be used which might offend a theatre patron in some country. Their principal difficulties come in reproducing authentic obsolete objects, such as uniforms, armor and clothing. Yet a good research director never will admit defeat.

"We never yet have been forced to send back word that we have failed," declared Miss Natalie Bucknell, head of the research department for Metro-Goldwyn-Mayer. "Recently a director called for photographs of the seven wonders of the world—and he



A map similar to this one is carried in the mind of the movie location manager who must be able to inform cameramen on short notice where they can find a required foreign setting within a few miles.

Sahara Desert Sheiks of the Talkies Cavort in Imperial Valley Desert

West of the Imperial Valley in southern California is found this ideal setting for a Sahara scene. Palm trees are held in position by sand-bags.

Dense tropical jungle is found on an estate near Hollywood.

wanted them in 24 hours. Ordinarily I should have searched many volumes to find them, but I remembered having seen plates of these in a child's book. So I sent them back with the same messenger. Some day, one of the seven wonders will rise on a southern California location and be filmed amid familiar surroundings.

"We must be very careful in dealing with customs, costumes, locales and historical events. We cannot use certain words. In the United States 'bum' and 'lousy' signify meanings so entirely different from their construction in England, that we cannot use them in an English picture. That is one reason we prefer technical advisers from the country to be represented in a foreign film."

In viewing a picture involving Alpine snow scenes or the Sahara desert, your mind follows your eye. Seldom do you examine the picture for incorrect details, and seldom will inaccuracies creep in. And there's a reason. The research department painstakingly arranges those details.

"What are the most difficult questions you have been called on to settle?" I asked Miss Bucknell.

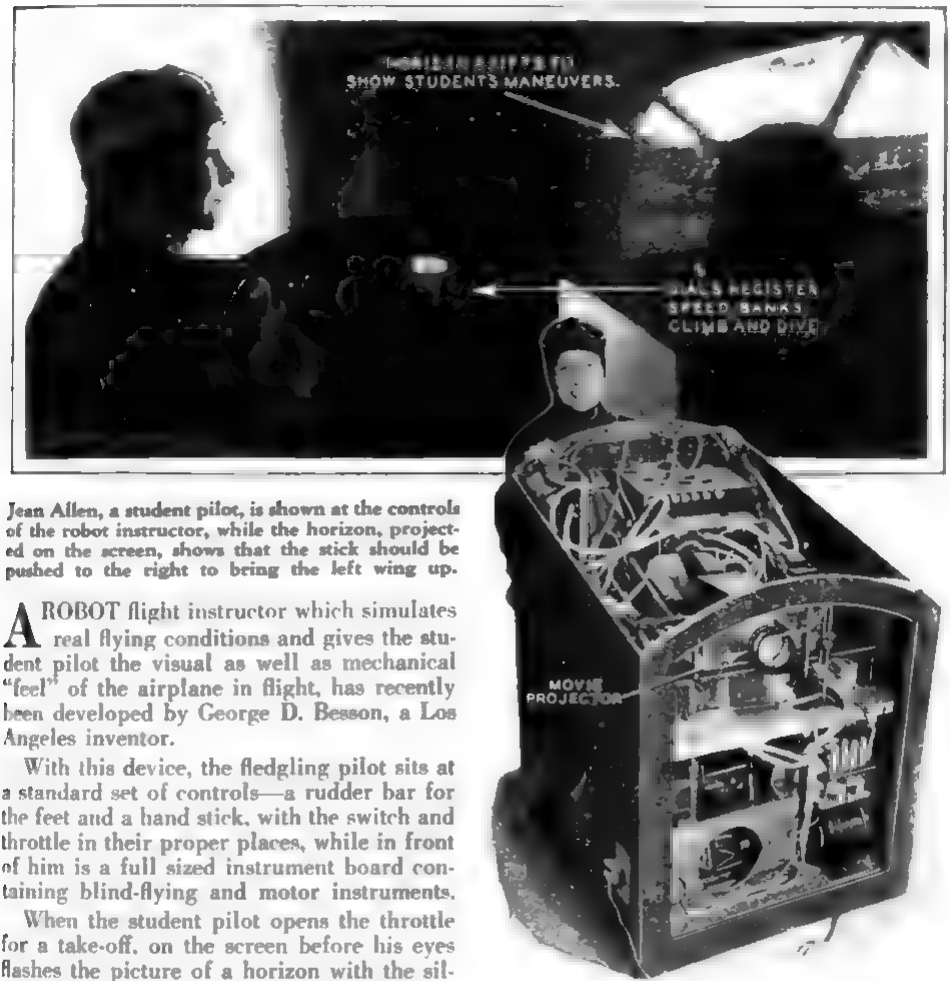
"Oddly," she replied, "these have not had to do with locations. Recently a director sent up a sheet of paper with two queries: 'What is the uniform worn by postmen in the capital of Iceland? And, how are corpses of persons of the Lutheran faith laid out in Germany?' Odd? Possibly. But it is of supreme importance that the letter carrier wear the correct cap and have the correct number of buttons on his coat, and that the corpse be laid out properly, or we'll begin to receive uncomplimentary fan letters pointing out our errors."

Another difficult problem comes in reproducing foreign prison scenes, foreign courtrooms, jails, etc. For years one studio has been making consistent efforts to obtain a series of pictures showing the interior of Scotland Yard. The Ritz bar in Paris was another much-sought scene. After many efforts the Parisian representative of one large film company, using methods he would not reveal, sent the pictures to Hollywood.

A recent picture shows actors at the

(Continued on page 194)

Robot Replaces Flight Instructor



Jean Allen, a student pilot, is shown at the controls of the robot instructor, while the horizon, projected on the screen, shows that the stick should be pushed to the right to bring the left wing up.

A ROBOT flight instructor which simulates real flying conditions and gives the student pilot the visual as well as mechanical "feel" of the airplane in flight, has recently been developed by George D. Besson, a Los Angeles inventor.

With this device, the fledgling pilot sits at a standard set of controls—a rudder bar for the feet and a hand stick, with the switch and throttle in their proper places, while in front of him is a full sized instrument board containing blind-flying and motor instruments.

When the student pilot opens the throttle for a take-off, on the screen before his eyes flashes the picture of a horizon with the silhouette of the plane's engine and wing struts in the foreground—a duplicate of the actual scene, with a miniature propeller whirling its blades through the line of vision.

Manipulation of the controls causes the horizon to shift exactly as it does in flight, dropping if the student pulls back the stick to climb and moving toward the top of the screen in a dive. Chinese flying is also revealed to the student, for with "One Wing Low" the horizon tips, as it also does in a bank and turn. Opening and closing the throttle causes the air speed indicator to register speed of flight, giving warning of stalling, or of too fast a dive.

Here's what you'll find under the cowl of the air-minded robot. This complicated mechanism bears no resemblance to the "innards" of a real airplane, but it gives the feel of flying nevertheless.

Trouble Light Has Magnet Base

THE flash or trouble light with magnet attached for holding it so as to leave hands free is now obtainable in a neat, well-designed lamp, with magnetic base and electric cord for attaching to any automobile electric system. It can be used, however, in any similar 6-volt circuit, and should prove useful around dark corners of houses, stores or shops.

Silent Telautographs Write Directions to Radio Artists

Operator in control room gives directions to performer in broadcast studio by writing over telautograph, shown above.

TO ELIMINATE all interfering noises in the National Broadcast Studios, engineers are installing noiseless telautographs which write out directions to performers, thus doing away with the old method of waving the hands to give signals from the control room. The telautograph is placed near the microphone, directly before the eyes of the performers, so that directions can be read without the least difficulty. Although quite a bit of the former human element is thus eliminated, the program goes along smoother, and no stray noises find their way to the mike.

The photograph at the left shows a performing artist receiving orders from the operator in the control room over the telautograph—an extremely convenient arrangement.

High Speed Paint Mixing Machine

A PORTABLE electric paint mixer powered by a light-weight motor and equipped with two brackets, one of which can be fitted on a five-gallon pail to hold the mixer and the other, when desired, on the shop's wall for mixing before going on the job, has recently been put on the market. Since the mixer is able to tint a five-gallon pail of paint in thirty seconds and to reclaim old paint that in many cases would be thrown away, it is a time, labor, and material-saver for both the professional and amateur painter. White lead is broken up in one-third the time generally needed.

This new mixer mixes paint in one-fourth the time required by hand stirring.

Hedge Cutter Operated by Crank

Turning the hand crank of this new cutter trims hedge with a minimum of time and effort. The device is supported by a shoulder strap as shown.

TIME and effort required to trim hedges is reduced to an absolute minimum by the use of a new hedge trimming device now available. The clipper is operated by turning a crank with the hands, as demonstrated in the photo above.

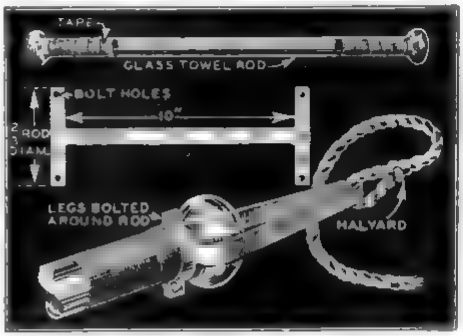
SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

Antenna Insulators From Towel Rods

THE trick of fastening glass towel rod insulators to the halyards and antenne wire is always a problem. Here is a simple but neat method of making the fastening and one that does away with any side strain on the glass, thus eliminating the hazard of breakage.

Wrap each end of the rod with friction tape as shown in the drawing at the right. Then form a holder of sheet brass about the shape indicated in the sketch. Bend the long portion in the center to form a V and wrap the two short sections about the rod and fasten with a short bolt. This brings the strain on the very end of the rod, looks neat and makes an efficient way to use these rods for insulators.



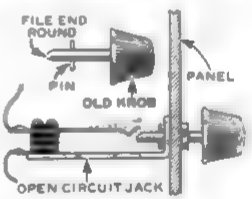
Sheet brass holder is bolted around taped ends of towel rod for hooking to halyard as shown here.

Make Your Own Solder Paste

RESIN makes an ideal soldering flux because it will not corrode metal. To make your own soldering paste, which you know will be pure, melt two parts of resin and slowly add one part of pure melted vaseline. This mixture will make a stiff paste when cool. In making the paste, melt the resin slowly so it will not burn. The safest way to do this is to place the dish of resin in a pan of sand heated by fire. Solder made in this manner is most suitable for wire joints in your radio set.

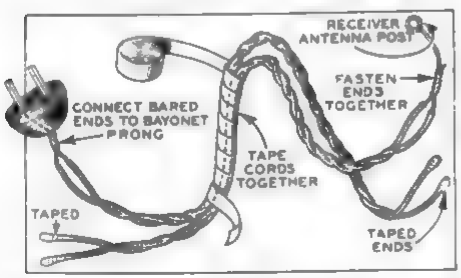
Improvised Panel Filament Switch

AN unused open circuit jack and a knob and shaft from an old rheostat makes an efficient and economical push-pull switch for the filament circuit when assembled as illustrated in the accompanying drawing. The jack is mounted on the panel, the shaft inserted and fitted with a pin.



Here is how jack and knob of the switch are mounted.

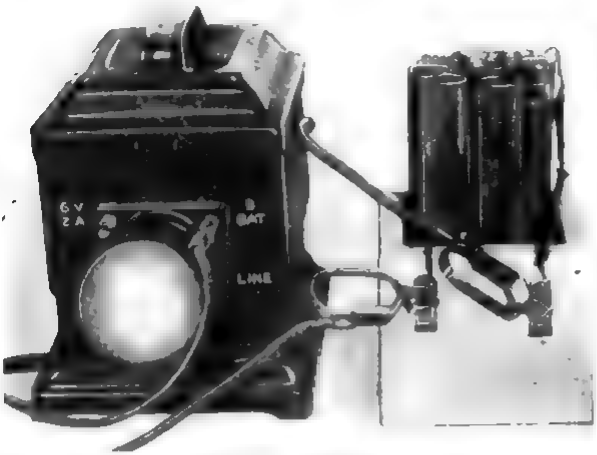
Lamp Cord, Tape, Plug Make Antenna to Bring in Loud, Clear Programs



Lamp cord of light socket antenna is bound with tape and ends hooked up as illustrated above.

WITH modern AC receivers it is unnecessary to use an outside antenna for good reception. An inside antenna which will bring in programs loud and clear can be made from a length of lamp cord hooked to a light socket plug as illustrated in the drawing at the left. Lay two eight foot lengths of lamp cord side by side, tape them together, and hook the bared ends together as shown. To put in use, hook one wire to receiver and plug prongs of other wire into wall receptacle. The condenser effect between the wires serves as the antenna for your receiver.

Rechargeable "C" BATTERY



Assembled group of Edison cells hooked up for recharging.

Build a battery of these Edison cells for your radio receiver and your "C" battery troubles are over. When a battery of this type is discharged, all you have to do to renew it is to hook it to your "B" battery charger, and in a few hours it will be ready to deliver full current again.

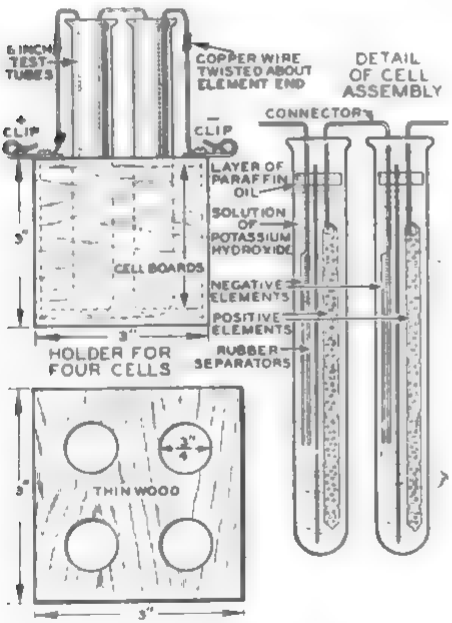


Fig. 1. Plans for construction of 4-cell battery.

THE Edison type of alkaline cell lends itself admirably to the construction of rechargeable "C" batteries because of its ability to retain a charge for an indefinite period. As the drain on a "C" battery is very small and slow, the capacity of the Edison cell will furnish all the current necessary for bias operation for long periods of time between chargings and can be recharged very quickly at minimum expense. Moreover, the initial expense of construction is small.

The "C" battery shown in the photograph above is one containing 10 cells and has an EMF of approximately 12 volts. The sketch at the left illustrates a battery of four cells furnishing about 4½ volts, which is large enough for a small "C" battery. Batteries of any voltage can be assembled. A 4½ volt battery can be charged directly from a 6 volt storage battery; the 12 volt size can be charged from an "A" battery charger and batteries of higher voltage can be recharged by any ordinary "B" battery charger. The only point to remember is that the charging voltage must be higher than the voltage of the "C" battery and the current rate must be very small—around 100 milliamperes, or one-tenth ampere an hour, being about right.

The elements consist of a long tubular and perforated affair, which is the positive side, and the negative portion, which is shorter, flat and lead colored. These are the same elements used in Edison "B" batteries. The cells consist of common glass test tubes six inches long and three-fourths inch inside diameter. Cells can be bunched together as shown in the accompanying photograph or can be assembled in a small box and supported by an upper and lower board containing holes into which the cells will fit snugly. Fig. 1 illustrates the 4½ volt size constructed in this manner. A thin wood box was built three inches deep and three inches square, inside measurements. Then a thin

CUTS Radio EXPENSES

piece of wood three inches square was placed in the bottom and one in the top and each one bored with four holes three-fourths inch in diameter. The four cells were then stood upright in these holes as illustrated in Fig 1.

When bunched together as shown in the photograph, separate each cell from its neighbor by wrapping once with corrugated cardboard. Then tie the group of cells together and insert in a suitable container to keep them upright. The tops of the cells should not touch, else they might short each other and cause the battery quickly to discharge.

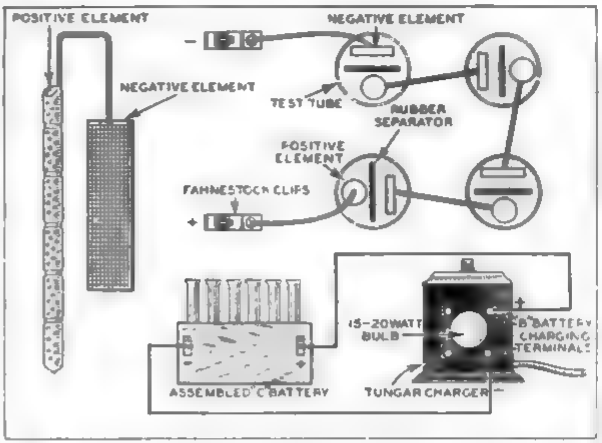


Fig. 2. Negative and positive elements are inserted in cells and hooked to Tungar charger as illustrated in above drawing.

To assemble and fill for use proceed in the following manner: Mix potassium hydroxide with cold water, adding the crystals slowly because of the heat generated, until the specific gravity when cold is 1,200. Test with a clean battery hydrometer but one which has never been used in testing ordinary acid type storage batteries. Any trace of acid will destroy the alkaline solution. One pound of potassium hydroxide will make enough solution to fill about 40 cells.

When the solution is cold fill each test tube to within about an inch of the top. Then insert a rubber separator into each tube. Place a positive element in the first cell on one side of the separator. Then place the negative side of a double element on the other side of the separator and insert the positive side in the next cell, as illustrated in Fig. 2. Repeat this until all the cells are filled in series.

Lastly, put eight to ten drops of pure mineral oil on the surface of the solution with a medicine dropper. This prevents the hydroxide from spraying during charging and also eliminates excessive evaporation. A final single element (negative) is placed in the last cell. Then connect a wire to each end element and carry down to the side of the case and fasten to a binding post or clip as shown in Fig. 1.

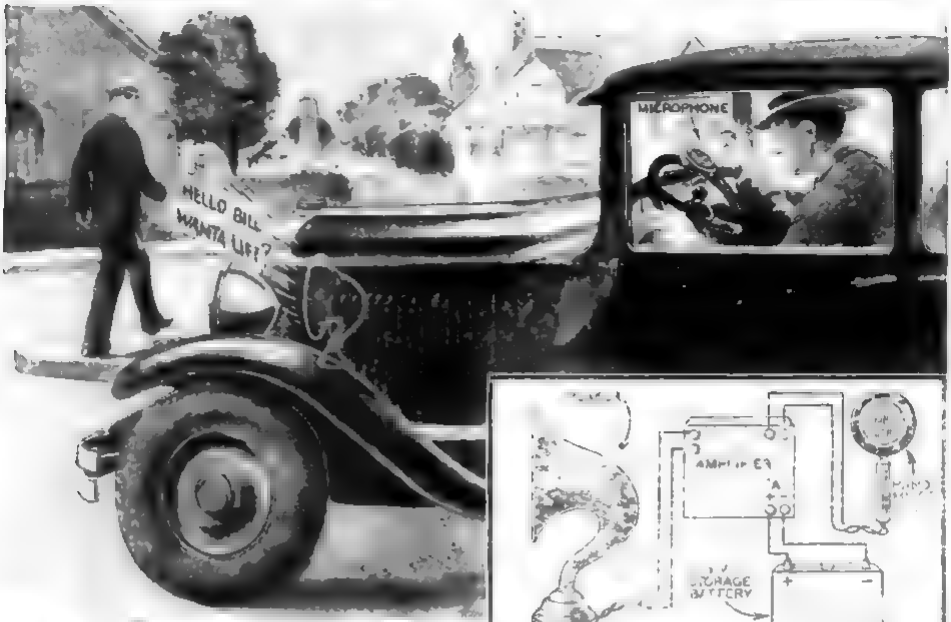
When charging a fifteen, twenty or higher voltage battery with a battery charger, use the "B" battery charging side with a 15 or 20 watt lamp in the charger line to reduce the charging rate. When charging a 4½ volt battery from a six volt storage battery wire, hook an old 201A tube in series with the plus side to reduce the current input. Other charging sources can be cut down in rate by using suitable resistances.

If you have an 0-100 milliammeter you can insert this in series in the line and thus see that the rate is not too high. From 10 to 15 hours charge will suffice. As the capacity of these cells is only about 1,500 mils, you can readily see that only a small current will be drawn from a storage battery when using this source for charging the small assemblies. Do not test for exhaustion with a hydrometer but use a voltmeter, and when the voltage has dropped a fourth it is time to recharge. For "C" battery use such batteries will be found to have a long life and will stand up to fifty rechargings before new solution is needed.

Costs for Radio Entertainment

FOR checking up the wattage consumption of radio tubes to estimate the cost of operating your radio set you will find the following table useful: Type 250—45 watts; type 281—15 watts; type 210—17 watts; type 245—18 watts; type 224 and 227—7 watts; type 171 and 112—10 watts. To compute costs, add wattages of tubes and figure one cent per hour per hundred watts.

Hail Your Friends with Auto SPEAKER

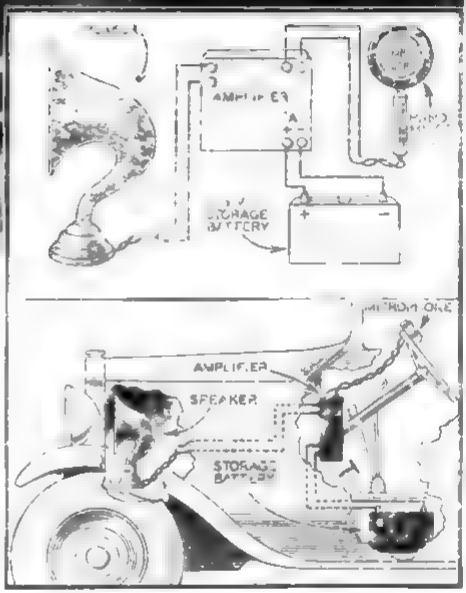


With this novel microphone arrangement you can hail your friends on the street by speaking into the mike attached to wheel as illustrated above.

TO BE able to hail your friends from your auto as you drive along the street, all you have to do is to install in your car a simple microphone arrangement consisting of a hand mike, an amplifier of the common two-stage type, and a speaker. With this novel stunt, you can merely speak into the mike and your voice will sound out loud and clear from the radiator of your machine, to the amazement of your friends who hear you.

The microphone can be of the regular button type, which can be purchased at any radio supply house. It is attached to the steering wheel, as illustrated in the accompanying drawing, to pick up your voice when you speak. The amplifier and "B" batteries—two 15 volt blocks—should be installed under the dash, where it will be easily accessible in case of trouble. The speaker will be most effective when supported under the hood, as near the radiator as possible, by means of a small platform or a length of pipe strap.

The hook-up is given in the accompanying wiring diagram. The hand mike should be hooked to the input terminals of the amplifier by means of a flexible cord, and the



The hand mike, amplifier, speaker and batteries are wired up as shown in top diagram. Drawing below shows installation of parts. Car storage battery can be used as "A" current source.

speaker to the output posts with No. 14 rubber covered wire. It's a wise idea to suspend the amplifier on springs to eliminate troublesome noises and to prevent damage to the tubes.

A two stage amplifier of the type used on antiquated radio receivers will be suitable as an amplifier for this auto speaker. You can easily obtain an amplifier of this type by scouting around some radio shop which handles second hand radio equipment.

Windows Easily Cleaned With New Handy Spray Gun

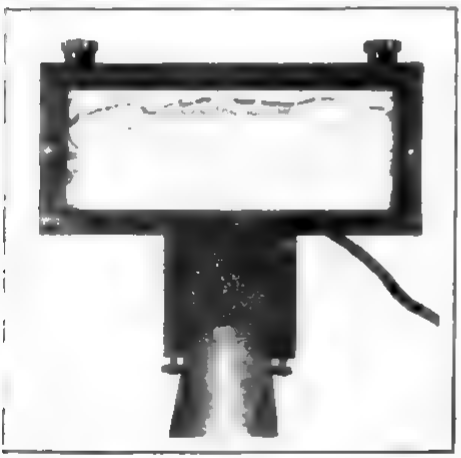
WITH a small spray gun now on the market, automobile windows and windshields and other surfaces of glass are quickly and effectively cleaned merely by operating a plunger which sprays a liquid compound especially suitable for the removal of dirt and grease from glass. The gun is economical, in that it uses very little cleaning fluid, and it takes up little space in a car.

Car windshields and windows are cleaned quickly and thoroughly by spraying them with special liquid compound from this handy spray gun.

Airplanes Beat Back Prairie Fire

WHEN flames from an onrushing prairie fire threatened to wipe out the March Air Field at Riverside, Cal., quickwitted army flyers hastily thought up an entirely new use for airplanes. They started up the engines, opened up the throttles, put on the wheel brakes, and blew the flames back whence they came, thus saving thousands of dollars worth of planes and equipment.

Auto Roll Road Map Fits on Wheel



Attached underneath steering wheel, this road map rolls and unrolls in holder at turn of knob. Maps are wound on spools like camera films.

MOTORISTS will welcome a new road map which, clamped immediately underneath the steering wheel, rolls and unrolls at the turn of a knob to expose in a glass window a map surface several yards long. Maps for various areas are fitted on spools and load like roll films of cameras. The map is always visible to the driver, and for night driving there is a light in the holder. Forty different maps are available for motorists at a moderate sum.

Pouch Holds Tobacco and Pipe

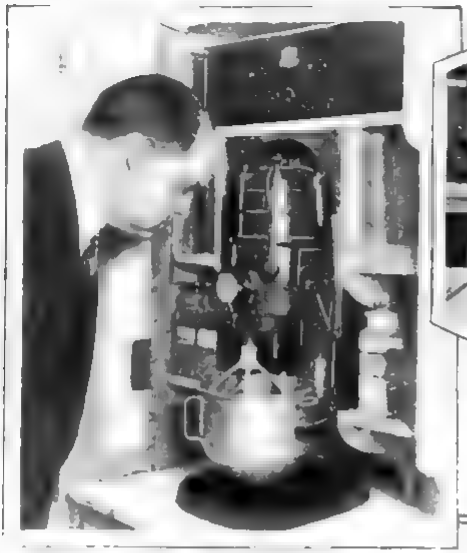
A LEATHER tobacco pouch now on the market holds both tobacco and a pipe of ordinary length. The pipe fits into a separate compartment at the bottom of the pouch, and is held in place by a strap that is fitted with a snap button.

The tobacco is removed from the top of the pouch by a quick pull on a zipper fastener, the pouch being closed in the same manner. The unit fits easily into the pocket, keeps the pipe from getting lost or mislaid, and holds an ample supply of tobacco for the average smoker. Pipe smokers will thus find it a great convenience, as the pipe and tobacco are always instantly available.

The accompanying illustration shows how the pipe is inserted into the bottom of the pouch.

New leather tobacco pouch shown in above photo holds average length pipe in compartment in bottom. Tobacco compartment is opened with zipper.

The HOUSE of a



The garage doors being opened automatically by the flash of automobile headlights at the Caldwell home.

The electrical machine in the kitchen that has over 150 uses. It does everything from beating of eggs to freezing ice cream. Note the radio set above it. Mr. Caldwell, the designer and owner of the house, claims that everything he has in his home can be duplicated for a few hundred dollars, on a smaller scale, of course. Meals may be prepared in this kitchen, a time clock set, and the meals will be cooked and heat turned off automatically.

O. H. Caldwell setting the automatic switch for the radio system. The ten radios can be made to play at will, controlled by means of electric clocks and switches.

WHAT might be called the most unusual house in America is the home of O. H. Caldwell, of Cos Cob, Connecticut. Mr. Caldwell is a noted electrical engineer and the former Federal Radio Commissioner. This house has over a thousand servants and yet has no servant problem, for all of the servants are electrical gadgets of one kind or another that do all the work.

Merely open the gate of this house and the building is flooded with light, inside and outside. At the flash of an automobile headlight the garage doors open automatically and the interior lights up. In summer the cool water from two deep wells is circulated through the steam pipes, thus cooling the house.

Ten radio stations sets situated in different parts of the house, all controlled by time clocks, are there to amuse you, and after you retire the radio will continue to play until you are asleep and then will automatically shut itself off.

The furnace is stoked by electricity, and there are over 100 outlets in the house for electric heaters, fans, piano, cleaning and laundry equipment, heated blankets, etc. The kitchen has 26 places to use electricity and one machine alone has over 150 uses. All of the cooking, heating and preparation of food is done by electricity.

Thousand Servants

Opening the front gate at the Caldwell estate automatically turns on the lights both inside and outside the house after dark. Electric clocks cut the switches so that the lights are not operated during daylight.

One of the electric stoves. Just set the switch, and when the meal is cooked the heat is shut off and a signal bell rings a warning.

Water in the wells on the Caldwell estate has a temperature of 50 degrees in summer, and is used for cooling the house.

Tiny 'Goliath', Three-Wheel Vest Pocket Car, Makes Hit

Above photo shows the new "Goliath" vest-pocket three-wheel auto now being marketed in Germany. The car is tax exempt.

DAY by day, in every way, small motor cars seem to be getting smaller and smaller. The latest in the way of diminutive autos comes from Germany, and is a vest-pocket machine so small that the German government exempts it from a motor vehicle tax.

Selling for $355, the new auto is a three-wheeled affair, and is large enough to carry two large or three small passengers without uncomfortable crowding. Passengers alight directly on the curb, unassisted by the customary running board.

How Candy Causes Tooth Decay

THE familiar idea that candy makes children's teeth ache or decay is denied by an eminent scientist, who proved his contention from experiments on dogs. The animals were fed for eight years on sweets, and it was found that the diet in no way affected their teeth. The tooth decay, it was learned, is largely due to absence from the diet of vitamines supplied by vegetables, milk, butter, eggs, etc. Eating candy tends to decrease the appetite for these healthful foods, so beneficial to the teeth.

Hand Levers Drive Side Wheeler

A DIMINUTIVE paddle wheel steamer powered by hand operated levers is the unique water vehicle utilized by James E. Marville, a one armed inventor of Wareham, Mass., to convey him to his favorite fishing grounds. The wheel at the side of the boat, shown above, controls the rudder, and the levers run the paddles.

This diminutive paddle wheeler is driven by hand with upright levers and steered by wheel at side. James E. Marville, shown above, is the inventor.

Odd Summer Home Defies Gravity

The elevated summer home built by resident of Koslin, Germany, which supports forty people, apparently in defiance of gravity.

ONE of the most unique summer homes to be found on the face of the earth defies all the laws of gravitation. Built by a somewhat eccentric resident of Koslin, Germany, to serve as a retreat providing solitude and plenty of fresh air, the elevated house, shown in the photo above, rises into the air without any explainable means of support. It is so strong, however, that 40 persons can stand on it and view the surrounding country. The home is attracting many sight-seers.

Amateur Electrician

Edited by SEWELL LEHMAN

A Reversing Switch for Battery Motors

HOW many times have you wanted some means of reversing the direction of your battery motor so the machines, model boat, or "what not" would reverse its direction? Well, here's a simple little reversing switch that can be made right on your own workbench and that will cost practically nothing. By a quarter turn of a knob the motor will instantly reverse, and as quickly turn again its normal direction upon a second twist of the knob.

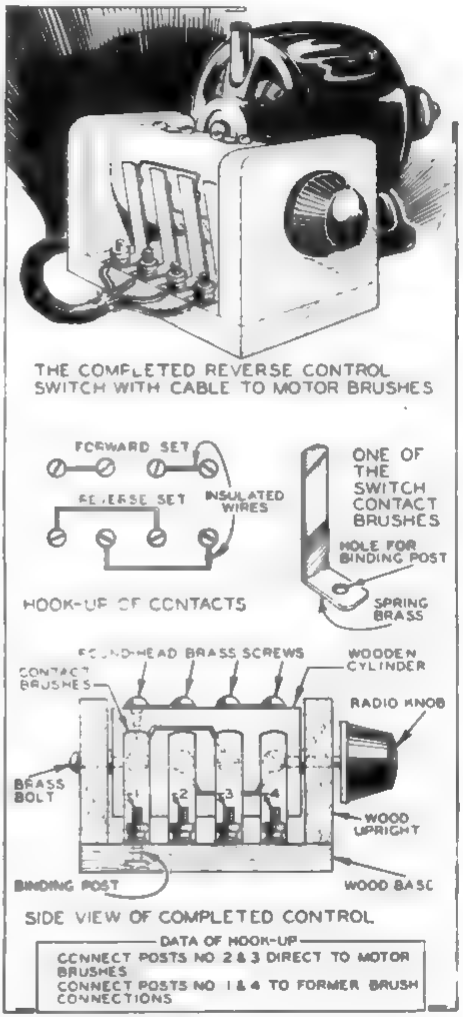
Use a piece of soft wood about four inches long for the base and erect a vertical piece at each end, as illustrated in the accompanying drawings. Then fit a cylinder of wood between these two uprights so that it will turn easily on two brass bolts inserted in the exact centers of the ends and through holes in the uprights. The end of one bolt should be fitted with a radio knob to facilitate turning the drum.

Along the length of the drum arrange four round headed brass screws equidistantly apart as shown. Then a quarter way around the drum arrange a second set of four screws the same distance apart, and in line with the first four. These rows are both numbered 1-2-3 and 4. Wire them together as shown in the wiring diagram of the contacts.

Now on the base fasten four spring brass contact brushes so that they will bear solidly against the screw heads on the drum. Fit each spring with a binding post.

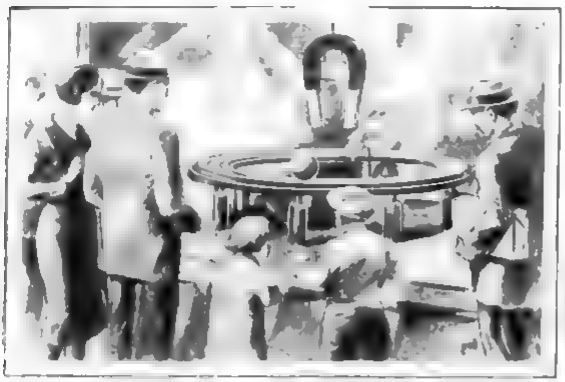
To connect for operation, first disconnect the two wires leading to the motor brushes. Then connect the two middle brushes of the switch,—3 and 4—to the brushes of the motor. Next, the wires removed from the motor brushes should be connected to the outer switch springs 1 and 4. In this way, when the drum is turned so that the springs bear against one set of screw heads, the motor will run in one direction, and when the drum is turned so the springs bear against the other set, the motor's direction will be reversed.

Such a device can be used conveniently on any DC motor where reverse direction is necessary. The entire device can also be utilized as a double throw switch for your radio set and mounted on a panel along with the rest of the apparatus.



Reversing switch is mounted and wired as shown here. A twist of the knob reverses the motor.

"Perpetual Motion" Machine



With the ball whirling around the tracks, this "perpetual motion" machine attracts attention of passers-by to advertisements.

For novelty in window displays you can't beat this "perpetual motion machine" as a means of attracting the attention of passers-by. Powered by magnets concealed in the tracks, the steel ball whirls round and round, bewildering those who pause to watch.

SCORES of people will walk right by an artistically decorated store window without giving the display a glance. On the other hand, another store window with a novel display catches the eye of every passer-by.

An unusual novelty, particularly if it is puzzling and mysterious, will attract and hold more attention than a $100,000 painting by a 16th century master.

The reason for the attraction is this: Movement always arrests the eye. Herewith is described a window display novelty which always commands attention. Not only once, but time and again. It consists of a device suggestive of the ever elusive phenomenon: "Perpetual Motion." Unlike many of the so-called "perpetual motion machines," it has no gears, belts or levers. It consists simply of a polished steel ball rolling "perpetually" around a circular track.

Suspended above the track is what appears to be a huge permanent magnet, which is for illusory effect only. The device makes a very puzzling illusion. The ball rolls about 30 miles in 24 hours, while an indicator records the mileage. Passers-by will pause time and again to see how many miles the ball has traveled.

Figure 1 gives the general appearance of this device. The tracks are made of 1/8" strips of brass mounted on a circular wooden base 42" in diameter. A 4-inch steel ball rolls on the track. The base is mounted on six clear glass bottles which serve, apparently, to insulate the device from the ground. Suspended centrally over the assembly is what appears to be a 30-inch permanent magnet. The ball rolls counter-clockwise around the track about 10 laps a minute. Every turn it trips the level of an indicator which registers the miles covered.

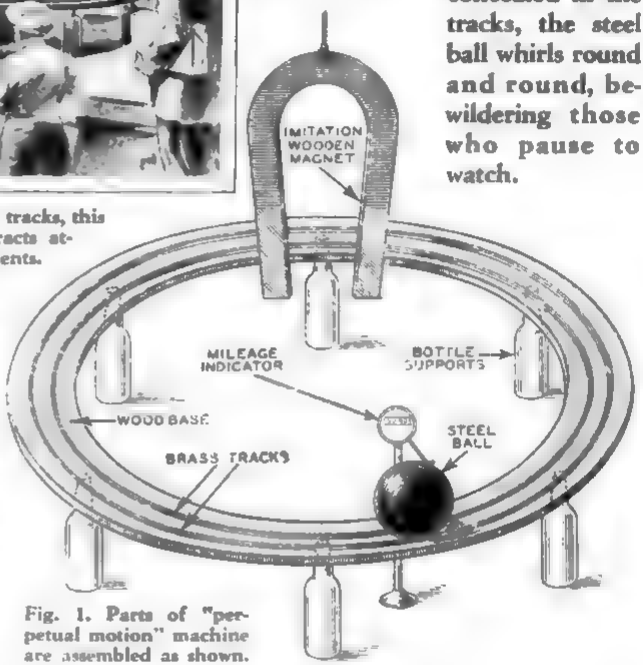


Fig. 1. Parts of "perpetual motion" machine are assembled as shown.

What makes the ball roll? Electro-magnets concealed under the track. How do they get their operating current? Through two bottles filled with acid solution which makes them conductive. The current is supplied by a six volt storage battery or by a small transformer such as is used for operating electric

Makes Novel Window Display

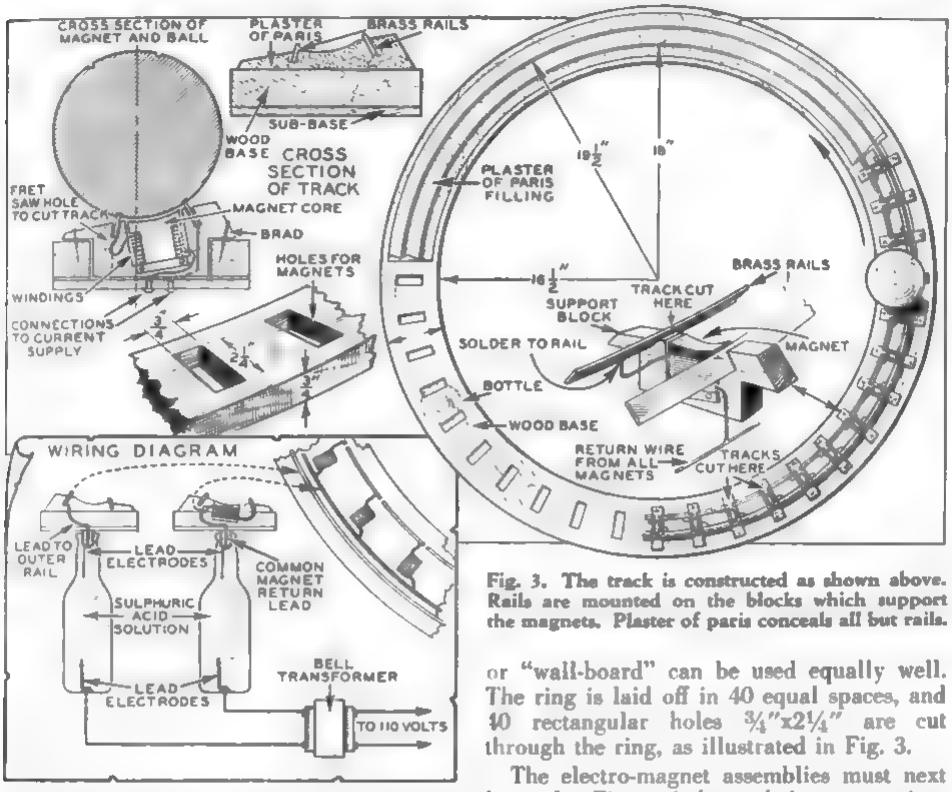


Fig. 2. Current is fed to rails and to the magnets through the acid solution in bottle supports, one wire leading to outer rail, the other to return lead.

Fig. 3. The track is constructed as shown above. Rails are mounted on the blocks which support the magnets. Plaster of paris conceals all but rails.

trains. The metal ball makes electric contacts across the rails in such a manner that the electro-magnet immediately ahead of the ball is always magnetized. As soon as the ball comes over the center of the magnetic field of that magnet, the contact is broken and made again with the next magnet ahead. While the pull of each magnet is very slight, only a very little effort is required to keep the ball moving. If the ball is true, and the tracks smooth and level, practically the only resistance is air friction. Two amperes at six volts will operate the device.

Figs. 3 and 4 illustrate the principal features of the construction. First, a wooden ring 42" in outer diameter, 4½" wide, and ¾" thick must be made. It is best to build this up of three laminations of ¼-inch wood. However, various forms of "plaster-board" or "wall-board" can be used equally well. The ring is laid off in 40 equal spaces, and 40 rectangular holes ¾"x2¼" are cut through the ring, as illustrated in Fig. 3.

The electro-magnet assemblies must next be made. Figure 4 shows their construction. The cross-ties, which serve to hold the magnets and the brass rails, are made of wood. Maple is recommended because it does not split easily. The slots for the rails are cut with a hack-saw blade. The rails should fit tightly in the slots. Note that a ¼-in. hole is bored vertically through the cross-tie adjacent to the inner rail slot. This is for the purpose of cutting the inner rail with a fret-saw later.

The cores of the electro-magnets can be cut from solid pieces of soft steel, but their magnetic property is improved by making them of laminated construction from 3 32-in. sheet steel. A large number of the pieces can be shaped at once by clamping them in the vise and using a saw, chisel and file. The finished plates are grouped to form the core, and are wrapped with about 100 windings of No. 32 enamel insulated copper wire. One of the ends connects to the inner rail section immediately to the left of the magnet. The other

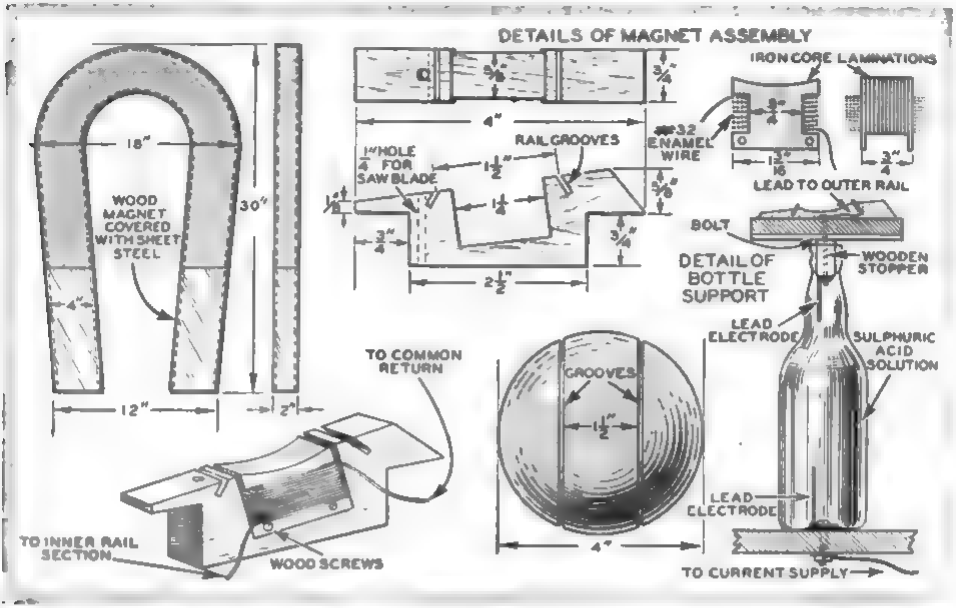


Fig. 4. The imitation magnet is built to dimensions given above. Magnet wire is wound over laminations and mounted on block support as shown. Lead strips act as electrodes to make contact with acid solution.

onnects to a common return wire to the l attery.

After all the magnet assemblies are prepared, they are placed in the holes in the ring base and wired up as shown. The brass strips for the rails are pressed firmly into the slots. Then a fret-saw blade is passed through the vertical holes in the cross-ties, and the inner rail is cut into 40 sections. Each section should be tested for a short circuit. The device is now connected temporarily to the battery, one wire leading to the common return wire, the other to the outer rail. The steel ball is placed on the track and given a little start in a counter-clockwise direction. It keeps on rolling! In fact, it may gain sufficient speed to "jump the track." A resistance should be installed in the circuit to regulate the speed.

After the tests have proved satisfactory, the rest of the work consists in "dolling up" and camouflaging. A circular, wooden ring ¼-in. thick is nailed to the bottom to hide the magnets and the wiring. Two brass bolts project slightly from the bottom, to connect with the lead terminals in the corks of the bottles filled with acid solution. Of course, provision will have been made that these bolts connect with the common return wire and with the outer rail respectively, as illustrated in Fig. 2.

The tracks and the magnets are coated heavily with melted paraffin. Then very viscous plaster of paris is poured between the rails. Before setting, this is molded into the form shown in cross-section view in Fig. 2. Afterwards it is well to paint it some dark color. The visible presence of plaster of paris immediately suggests concealment.

Figure 4 shows the construction of the camouflage magnet, and suggests a means of obtaining a true rolling ball. A governor ball from an old steam engine may be picked up at a junk-yard and will serve the purpose very well. The 4-in. dimension is not essential.

The mileage indicator is mostly for psychological effect, but may be dispensed with. Curious passers-by will stop daily to see how many miles the ball has traveled. New signs will greet their eyes. With very little trouble, a mileage indicator from a bicycle can be remodeled to serve the purpose.

This "perpetual motion machine" compels attention. It is an excellent advertising attraction for any store window. Few passers-by are artists; every passer-by is curious.

The device will attract considerable attention to any display or signs set up in your window along with it. While watching the ball their eyes will fall on the signs.

Balloons on Helmet Make Targets for Cavalry Combat

PUNCTURING a balloon on the head of an opponent with the skillful thrust of a rapier is the unique means employed by cavalry students to score points when engaging in "armed combat" at Urban Military Academy at Beverly Hills, California. The balloons are tied to the helmets of the combatants, and the first fighter to burst the balloon of an "enemy" wins the encounter.

Although swordsmanship is a thing of the past, as far as modern warfare is concerned, this kind of practice is of service in teaching agility, alertness and horsemanship. The contest is a part of the training for the annual spring maneuvers of the academy.

Points are scored by bursting balloons on opponents' helmets.

Machine Reads Your Head Bumps

YOUR character read while you wait is the amazing feat performed by a new machine called the "Robot Phrenologist." A cap equipped with a battery of fingers fits over the head and sends electrical impulses to a recording device, shown below.

"Robot Phrenologist" which reads your character.

Does Lightning Scatter Poison?

THAT lightning may strike dead by some mysterious ray or poison as well as by the electric stroke itself was suggested recently by a well known scientist. This suggestion was based on the fact that when lightning has struck a tree in a forest. leaves or branches of nearby trees and other plants die as though blasted by extreme heat or by some other mysterious power. One explanation to the mystery is that the ultra-violet rays which accompany the flash are powerful enough to kill the living leaves. Another explanation is that lightning creates in the surrounding air some unknown chemical which is a poison that kills all vegetable life.

Garden Ornament From Gas Grate

TO MAKE an attractive and artistic design to set off a point in yard or garden architecture. take an old gas stove grate, apply your contrast colors. as illustrated in the photo at the right, and you will have a creation that is as striking as you could wish. Staples make make fine fasteners.

Mounted as shown here, the grate makes an attractive garden ornament.

Tricycle Vender Solves Girl's Unemployment Problem

Miss Clara Cage, of Hollywood, riding novel tricycle ice cream vender with which she solved her private unemployment problem.

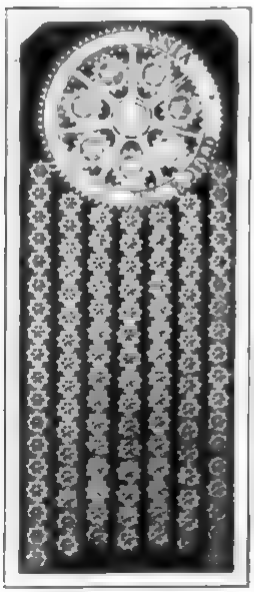
UNABLE to find suitable employment in her profession as a typist, Miss Clara Cage, of Hollywood, discovered an unusual method of earning a living. She rigged up a tricycle as a delivery wagon and now delivers cartons of ice cream direct to consumers. During hot spells Miss Cage turns many a pretty penny by pedaling her way about the streets on her tricycle, which is shown in the photograph at the left. Along Hollywood boulevard, her favorite selling area, she attracts attention by her novel togs and vehicle.

Handy Lighter Built in Cane

ONE of the novel and striking features of the recent British industries exhibition was a walking stick equipped with a gasoline lighter for the convenience of smokers. The lighter is built into the handle of the cane, as photo below shows, and is brought into action by pressure on a small button. Such a device proves a great boon, for it saves considerable fussing around for a lighter or a match. The device is filled with gas from a small opening beneath the cover.

The new handy cigarette lighter built in head of cane for convenience of smokers when walking.

121 Rotary Wheels Carved in Gold



These 121 cog wheels, all turning as one, were carved in gold for Rotarians.

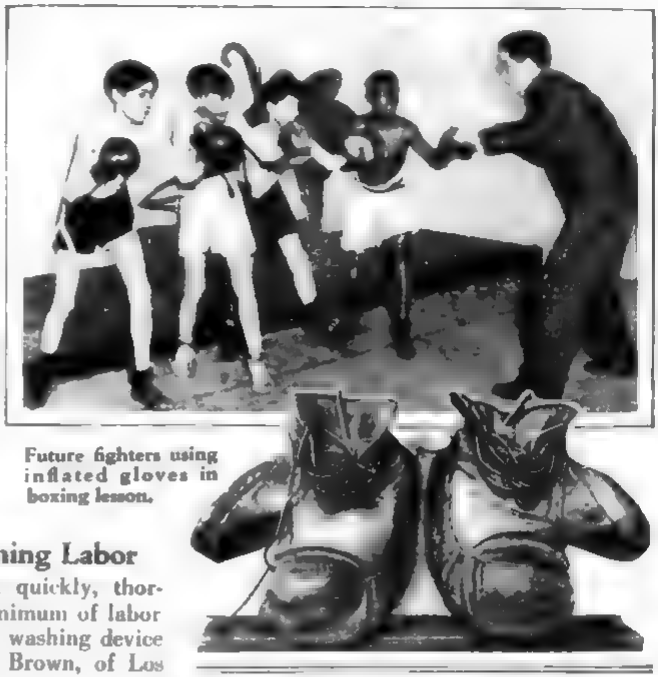
ONE hundred and twenty-one cog wheels of solid gold, all turning as one, is one of the latest novelties in the mechanical line. These golden cogs were made for the Rotary clubs of California at an expense of several thousand dollars, the gold alone being worth $1500, without the workmanship, which involved an enormous amount of engraving. The wheels are each engraved with the name of some city in the United States and Canada.

New Rays From Electrified Alum

NEW invisible rays which are neither X rays nor rays of ultra violet radiation but which resemble both of these have been investigated by Dr. Isay A. Balinkin, of Cincinnati University. The generator of these new rays consists of a small pellet of powdered alum, compressed into nearly solid form like a medicinal tablet, to which is applied a high tension electric voltage.

Air-Inflated Gloves Make Boxing a "Gentleman's Game"

AIR-inflated boxing gloves having many distinct advantages over the old style padded mitt have recently been introduced into the field of amateur pugilism. With the customary padding eliminated, they are much lighter in weight, and thus help to prevent the fighter from tiring easily. As these new gloves are not easily broken, the knuckles cannot be pushed through the leather for practicing any "dirty work." A blow is distributed over greater area, and hence less shiners and busted noses.



Future fighters using inflated gloves in boxing lesson.

These new light weight boxing gloves are inflated by blowing through special valves placed in heel.

Saves Window Washing Labor

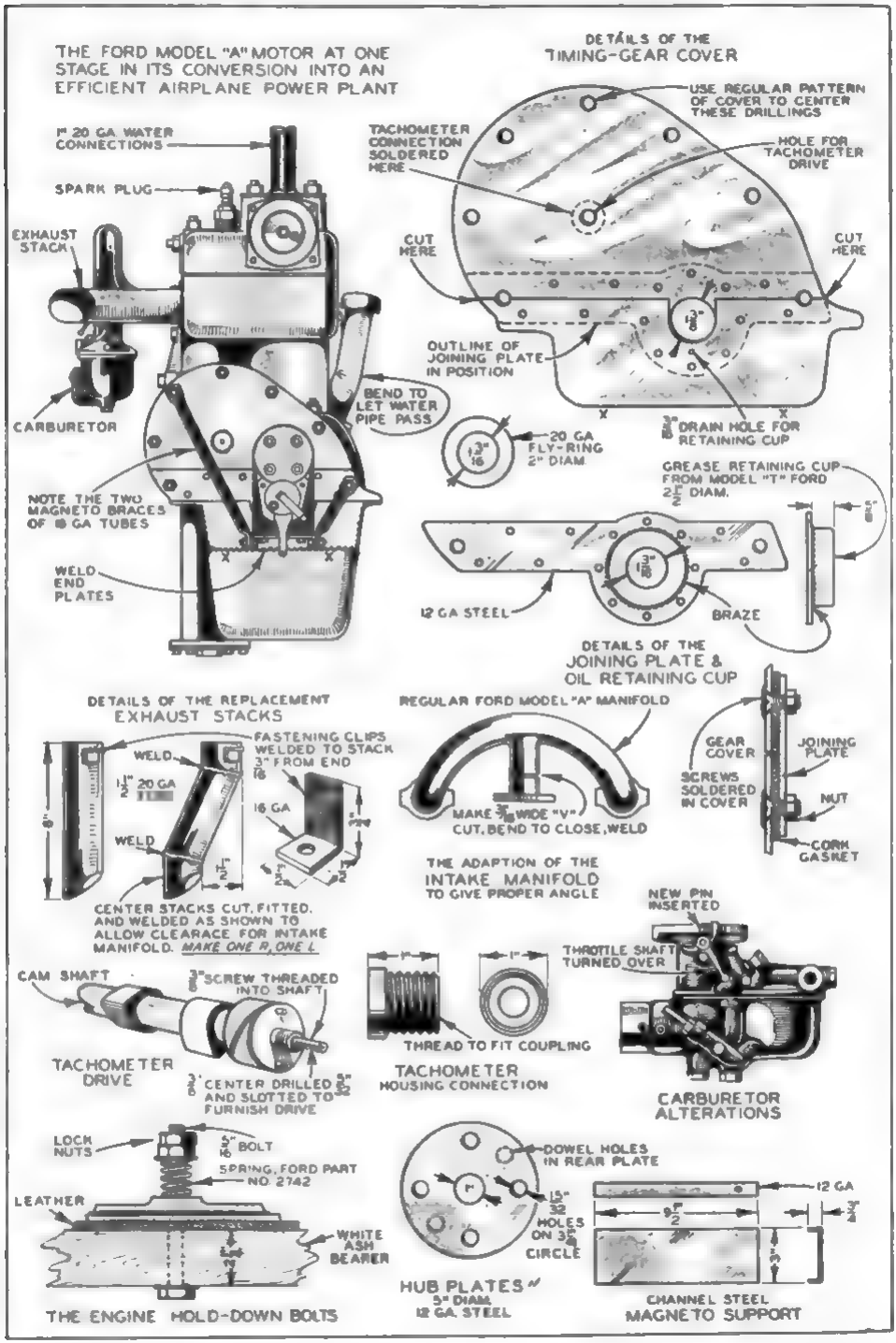
WINDOWS are cleaned quickly, thoroughly, and with a minimum of labor by the use of a new window washing device recently invented by E. H. Brown, of Los Angeles. The portable device fits in a permanent slot outside the window, which is washed by raising it against the scrubbers, as illustrated in the photo below.

E. H. Brown, Los Angeles inventor, demonstrating his portable labor-saving window washing device.

Future Home to Be All Automatic

DAYS when food will be cooked in automatic pans that whistle or call out when the food is done, when the amount of salt or pepper to be used will be determined not by the cook's taste but by an infallible electric probe dipped into the dish, when different rooms in the house will be heated automatically to different temperatures as prescribed by the family physician for different activities like work or play or sleep, when windows will open or close when one wishes merely by whistling at them—all are predicted by the well-known English physicist, Professor A. M. Low, in a recent article in his magazine, "Armchair Science."

No vocation could be more remunerative, Professor Low believes, than inventing automatic devices for saving time and increasing convenience in homes. The home of the future will be equipped, Professor Low predicts, with hundreds of such automatic conveniences undreamt of today except by the inventors who are creating them.


THE FORD MODEL "A" MOTOR AT ONE STAGE IN ITS CONVERSION INTO AN EFFICIENT AIRPLANE POWER PLANT
1" 20 GA WATER CONNECTIONS
SPARK PLUG
EXHAUST STACK
CARBURETOR
BEND TO LET WATER PIPE PASS
NOTE THE TWO MAGNETO BRACES OF 18 GA TUBES
WELD END PLATES
DETAILS OF THE TIMING-GEAR COVER
USE REGULAR PATTERN OF COVER TO CENTER THESE DRILLINGS
TACHOMETER CONNECTION SOLDERED HERE
HOLE FOR TACHOMETER DRIVE
CUT HERE
CUT HERE
OUTLINE OF JOINING PLATE IN POSITION
DRAIN HOLE FOR RETAINING CUP
20 GA FLY-RING 2" DIAM
GREASE RETAINING CUP FROM MODEL "T" FORD
12 GA STEEL
BRAZE
DETAILS OF THE JOINING PLATE & OIL RETAINING CUP
DETAILS OF THE REPLACEMENT EXHAUST STACKS
FASTENING CLIPS WELDED TO STACK 3" FROM END
WELD
20 GA
16 GA
WELD
CENTER STACKS CUT, FITTED, AND WELDED AS SHOWN TO ALLOW CLEARACE FOR INTAKE MANIFOLD. MAKE ONE R, ONE L
REGULAR FORD MODEL "A" MANIFOLD
MAKE WIDE "V" CUT, BEND TO CLOSE, WELD
THE ADAPTION OF THE INTAKE MANIFOLD TO GIVE PROPER ANGLE
GEAR COVER
JOINING PLATE
SCREWS SOLDERED IN COVER
NUT
CORK GASKET
NEW PIN INSERTED
THROTTLE SHAFT TURNED OVER
CARBURETOR ALTERATIONS
CAM SHAFT
SCREW THREADED INTO SHAFT
TACHOMETER DRIVE
CENTER DRILLED AND SLOTTED TO FURNISH DRIVE
THREAD TO FIT COUPLING
TACHOMETER HOUSING CONNECTION
LOCK NUTS
BOLT
SPRING, FORD PART NO. 2742
LEATHER
WHITE ASH BEARER
THE ENGINE HOLD-DOWN BOLTS
DOWEL HOLES IN REAR PLATE
HOLES ON CIRCLE
HUB PLATES 5" DIAM 12 GA. STEEL
12 GA
CHANNEL STEEL MAGNETO SUPPORT

The PIETENPOL-FORD Motor Conversion

by **B. H. PIETENPOL**

This is the fourth and last of a great series of articles showing how an airplane can be built around the Ford Model A power plant for less than $500. Details of the motor conversion, given below, complete this series on the building of the Pietenpol Two-Seater Air Camper.

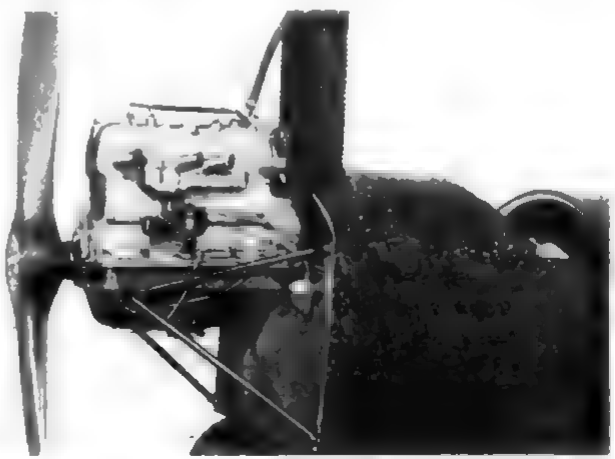
ACCORDING to the letters we've been receiving in the MODERN MECHANICS AND INVENTIONS office, you fellows who have been following this series of mine on the Ford-powered Pietenpol Air Camper have been mighty hot about getting the motor dope. Here it is—all of it.

The Ford motor makes an ideal power plant. It is rugged and very reliable. It is comparatively low speed, and can be serviced anywhere the ship may be forced down. And it is cheap enough to be easy to buy. The whole motor, brand new, costs but little more than a hundred bucks, and when converted as shown in this article will develop a good 38-40 h.p., which is enough to fly two people in the Air Camper monoplane, the design of which I have just finished giving to you cloud hoppers in the last three issues of M. M.

At the flywheel end of the motor you will note that there are no changes to be made. The flange to which the flywheel fastens is left as is. Against it is fastened a length of Model T axle, the end of which goes into the differential. This is held in place with 7/16" bolts which are double fastened. By this I mean that the two flange faces are held together with nuts threaded onto the bolts, and that the ends of the 7/16" bolts are left to run out so as to be long enough to allow the retaining plate for the propeller to be placed over them and fastened and cotter-keyed on.

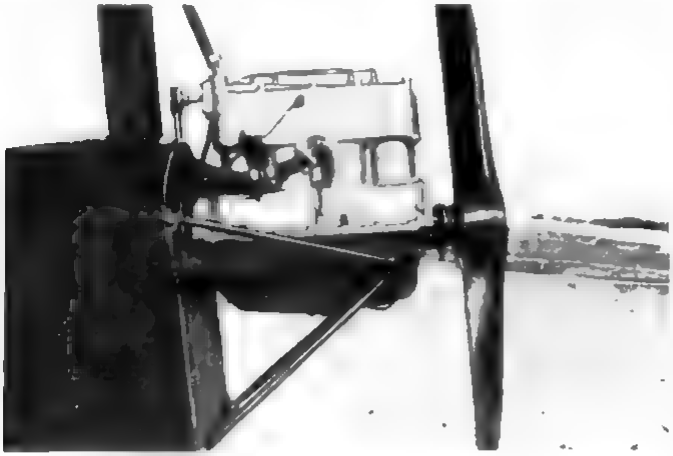
You will find the axle will not be thick enough to fill out the hub of the standard Lawrence 28 war surplus prop which is used with this motor, so a wood turned birch bushing will have to be made and fitted tightly over so that the propeller is on center. Then a 16 gauge retaining plate is made and the prop is on the motor for good. Yet it is readily demountable.

We have used this prop installation for a long time and it has yet to fail us. I believe it to be far more rugged than is necessary.



View of left side of motor installed in the Pietenpol Air Camper. Note the location of the radiator and the use of individual exhaust stacks.

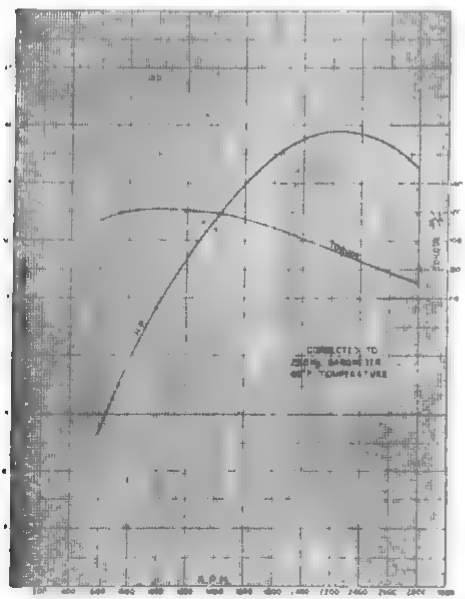
Right Side of the Ford Motor in Place on Airplane



This photo shows how oil intake is bent to permit water line to pass.

The crank case will have to have some work done on it to revamp the oiling system. A feed pipe from the oil pump will have to be let into the forward crankshaft bushing. The face of the crank web takes all the thrust, and since it is designed for all of the clutch and de-clutch loads of the husky Ford car, we have found that a thrust joint or bearing is a waste of time and money, as the bearing as it stands will thoroughly take care of all of the prop thrust loads. We ran one of our ships 240 hours and found slightly less than 1/64" wear at the bearing. Which proves that it will handle the comparatively light load very nicely.

The center bearing, you will note from the middle view on opposite page, is fed from the same oil pump take-off. To the right of the figure is shown the method of drilling the bearing casting and tapping the pipe into the journal.



Graph of the power curve of the Ford Model A motor conversion; 1600 rpm's deliver 35 h.p.

The splash pan is rebuilt. You will find that a welded apron up front is needed. This catches the drip from the front bearing. Also the pressure line from the fuel pump is run forward and exhausted on the apron under No. 4 cylinder, which in the case of an airplane installation becomes No. 1 cylinder and will so be called in order from this point on. Cylinders Nos. 2, 3, 4 have oil dams built in the pan so that there is assured a supply of oil at all times. The ordinary indentations in the Ford pan allow the oil to travel toward the tail of the ship too fast, and the front crankpin bearings do not get the splash feed they need if these are left out.

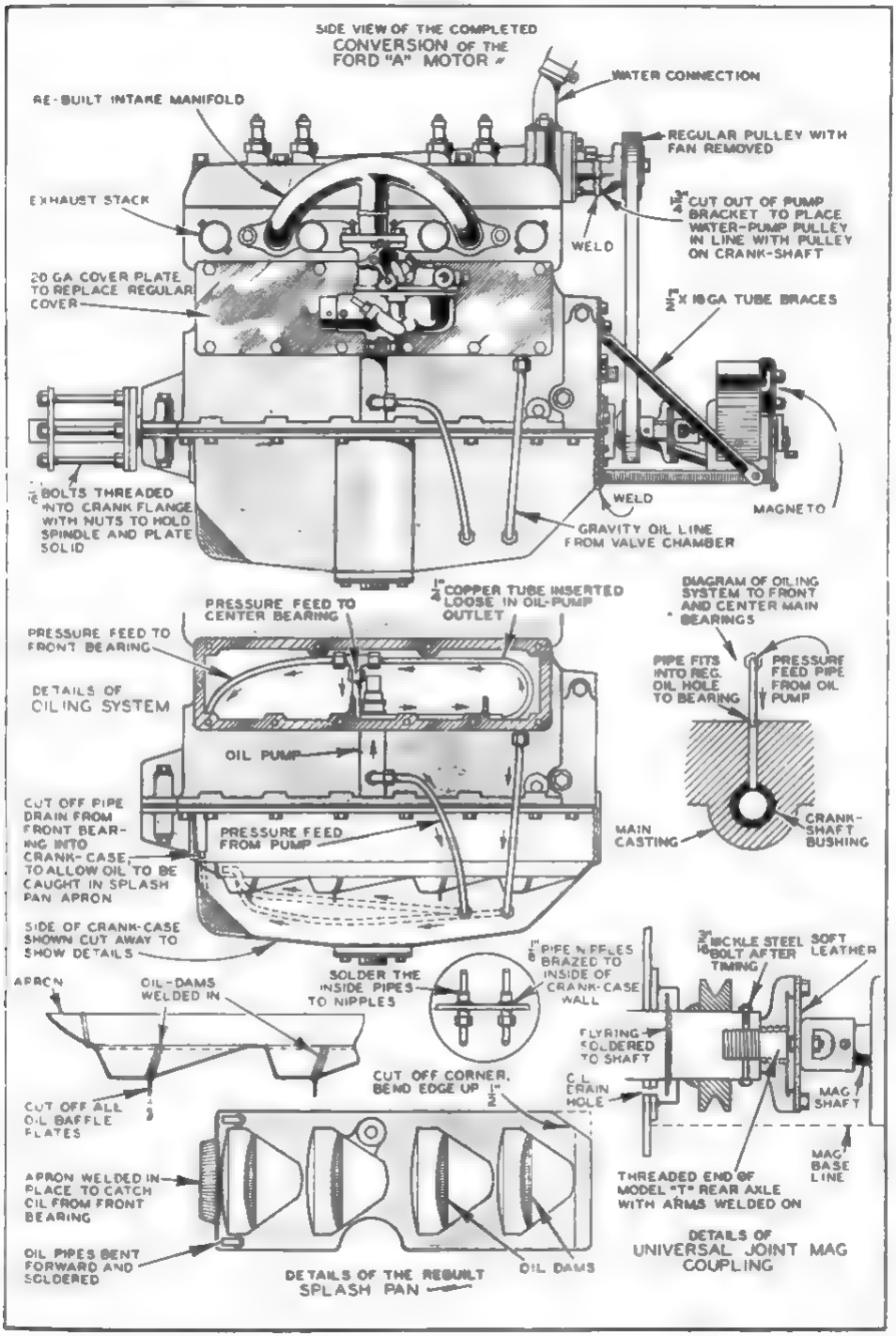
Off in the right hand corner a chip can be dog-eared off the corner of the pan to allow for the surplus to drip back into the lower base. The edge must be bent up ½" to allow a good reserve of oil to be carried in the splash.

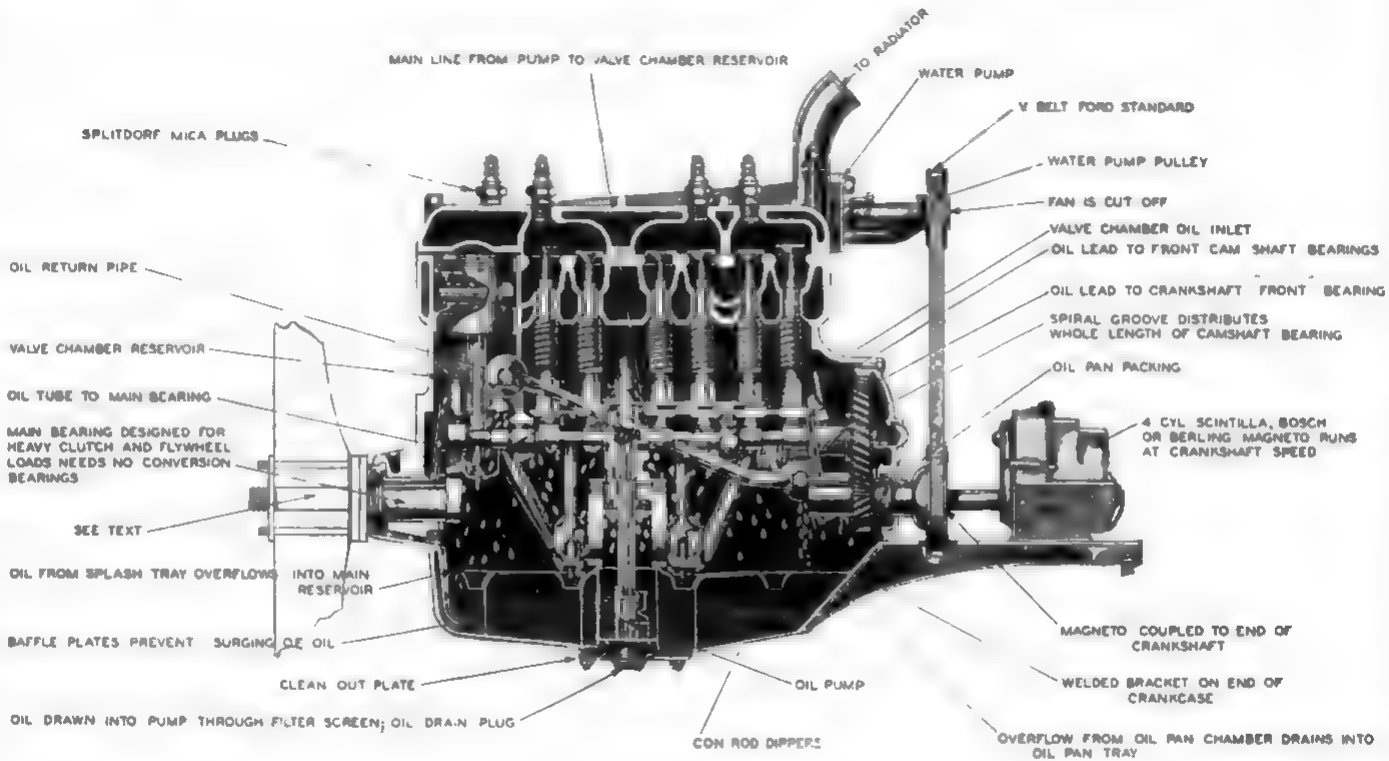
The method of leading the pipes through the base is made very clear by the drawing, as it shows how the brass nipples are brazed into the crank wall and how the pipes are led from this point to the places where you want the oil to be delivered.

The regular cover plate of cast iron on the valve chamber is too heavy and you will have to make a 20 gauge plate to replace it. This saves several precious pounds of weight and is better looking as well as being tighter.

The intake manifold is rebuilt to be shorter. There is a tendency on the part of

Oiling System of Model A Motor Must be Changed for Use on Airplane





This is a sectional drawing of the Ford Model A engine as it is built for automobile use. The prop and the magneto mounting have been drawn in to show where they fit. Compare this illustration with the two full page drawings printed elsewhere in this article, and you will realize how very little needs to be done to convert the Ford auto motor to airplane use. Designer Pietenpol recommends 1600 r.p.m. as the best speed to run the motor; the engine develops about 35 horsepower at this rate.

the intake to frost up, and the shorter you make the intake pipe the better performance you will have. Also there is need to get the carburetor outside and away from interference with the motor bed, so the change is imperative. By removing the carburetor, and the manifold, and sawing out a 3/16" slot in the back side of the neck, the carburetor is made to be level and is automatically made to clear the cowling.

Welded, the installation can be made and will prove highly serviceable. You see, I have found by experiment the amount of cut needed to get the carburetor level when the ship is flying level.

There is only one detail of the oiling system as yet left unexplained. That is the need for an oil ring to be soldered around the aft end of the crankshaft.

The drawing shows how this is put in. It is necessary to use this device to keep the motor from throwing oil all over the magneto, which would soon short.

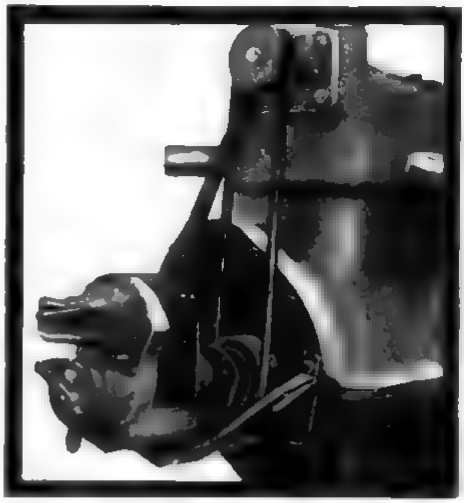
The water pump must be shortened 1¾" to place the water pump pulley in line with the pulley on the crankshaft. The regular Ford pulley is used, and the regular Ford belt. We have found that they are perfectly satisfactory.

The method by which a fabric universal joint is built into the end of the crankshaft is shown in the drawings in diagrammatic form. It can be altered to suit the magneto you use.

Also the bracket I show is made to fit the type of magneto we used. We found that the reliability of the magneto and the extra weight saved, together with the added ease in starting, was well worth the extra cost involved in getting a war surplus magneto and fitting it on. There is a snap to that old magneto spark that gives the motor extra heart when you have about five thousand feet of alty and the road gets bumpy.

You will note that a light water outlet to the radiator is to be made. This can be made out of light sheet metal of about 20 gauge and should have an uptake long enough to allow a good hose clamp connection to be made.

Close-up of the Magneto Mounting



Here is the magneto installation, showing the special bracket which is welded and bolted to motor.

With the oil system changed according to the drawings, which is an absurdly simple operation when you come to look at a Ford motor and realize how close it already is to being an airplane power plant, and with the magneto and the water and carburetor alterations made, there is very little left to do to make the motor a complete airplane plant except the fitting of stacks and the fitting of controls.

The end plates for the crankshaft and for the cam gears are very simple and are shown in complete detail. They are cut out of 16 or 18 gauge plates and their cutting and fabricating can be done from cardboard patterns made direct from the motor. The method of making the cup for the oil ring previously mentioned can plainly be seen also.

The method of making the tachometer fitting and putting it to the end of the camshaft is simple. A ⅜" hole is drilled in the center of the camshaft and the 5/32" center-drilled rod for the tach drive end is fitted in.

(Continued on page 188)

BLUEPRINTS FOR THE PIETENPOL AIR CAMPER

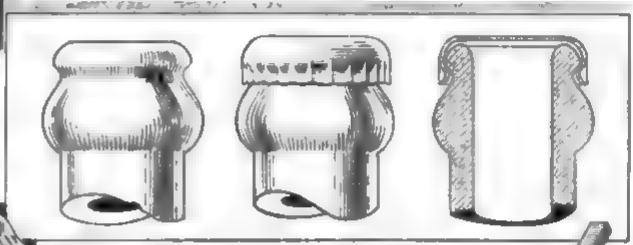
A set of shop blueprints from which you can build a two-place Pietenpol Air Camper in your own workshop can be obtained from Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn., for $7.50. The prints show the motor conversion details in addition to complete plans for wings, fuselage, etc. Two fuselages are shown so that you may choose between steel tubing or stick and wire construction.

There's Money

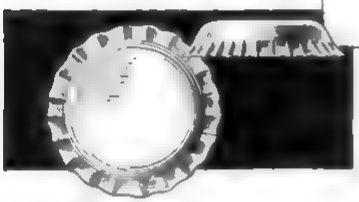
by CLARENCE A. O'BRIEN
Registered Patent Attorney
Washington, D. C.

The greatest profit does not always come to the inventor of a complicated machine—often the inventor of some simple, much-used article stands a more favorable chance of making a fortune.

Clarence A. O'Brien, registered patent attorney, who has started many patents on the road to success.



This simple invention, a metal cap which seals bottles air tight, reaped a fortune for its inventor because of its usefulness and economy.



WHILE such complicated inventions as the radio, the airplane, the telephone and the electric light are among the major blessings of this modern age, yet we often lose sight of the fact that there are a greater number of simple devices which are contributing greatly to our everyday comfort, convenience, and enjoyment of life. And it is for this reason that the invention of these humble devices, when they were properly patented and marketed, have been the source of great fortunes for their inventors.

Among these simple contrivances which have piled up wealth for many inventors may be listed the metal cap which seals bottles airtight, the paper match, the tip for shoe laces, the safety pin, and the umbrella which folds up into its handle, all of which are illustrated in accompanying drawings. These are ideal examples of simple discoveries, because they illustrate the great truth that to go out of the beaten path and make an invention pay, you must have an article of merit which can be of great service to the greatest number of people.

Now, while the above mentioned inventions are noted for their success, the question naturally arises in the embryo Edison, "Why do

Providing the utmost in convenience and economy, these safety paper matches are now widely used for advertising.

Even improving on simple devices already invented brings great profit. Addition of coils to safety pin aids in disengaging the point from its guard. Illustrations are redrawn from patent records.

in SIMPLE INVENTIONS

some inventions succeed and others fail?"

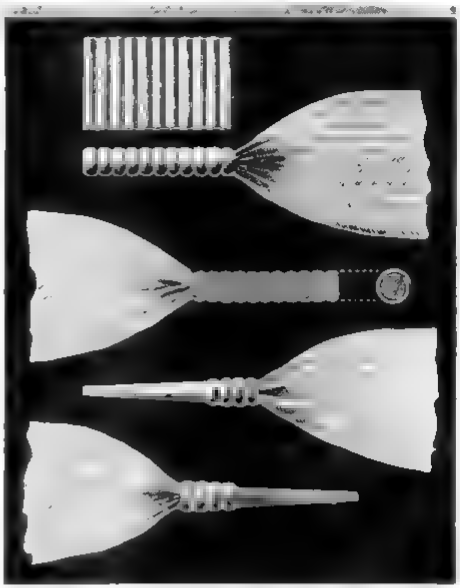
Unsuccessful patents, and there have been thousands of them, fail for various reasons. The invention would not work. The cost of manufacture was too great. The idea was not new. But the chief reason for failure in a great many cases can be traced to the fact that there was no demand for the invention, or to failure to create a demand where none existed before.

The best type of invention, therefore, whether simple or complicated, is that which eliminates the most factors of uncertainty in establishing a market for it. As far as the marketability or salability of inventions is concerned, they may be classified as follows: 1. Inventions which save labor: 2. Inventions which save time: 3. Inventions which save trouble; 4. Inventions which save money; 5. Inventions which save annoyance.

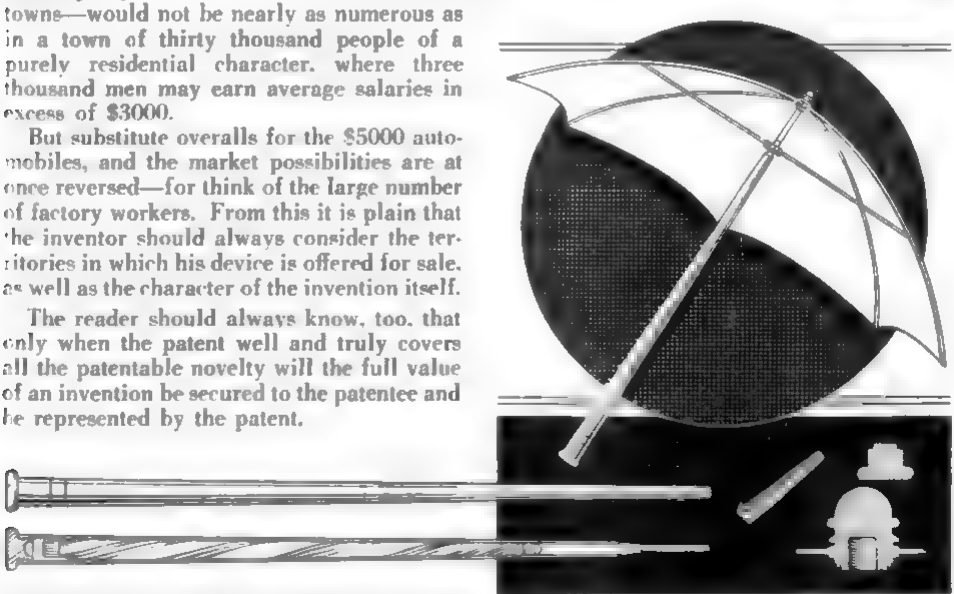
Inventions may also be graded as to their commercial or sales-pushing value. Make a survey of the number of probable users of the invention. For example, the possible sales of a $5000 automobile in a city of thirty thousand people in which only a few earn $3000 per year or over—as in certain mill towns—would not be nearly as numerous as in a town of thirty thousand people of a purely residential character, where three thousand men may earn average salaries in excess of $3000.

But substitute overalls for the $5000 automobiles, and the market possibilities are at once reversed—for think of the large number of factory workers. From this it is plain that the inventor should always consider the territories in which his device is offered for sale, as well as the character of the invention itself.

The reader should always know, too, that only when the patent well and truly covers all the patentable novelty will the full value of an invention be secured to the patentee and be represented by the patent.

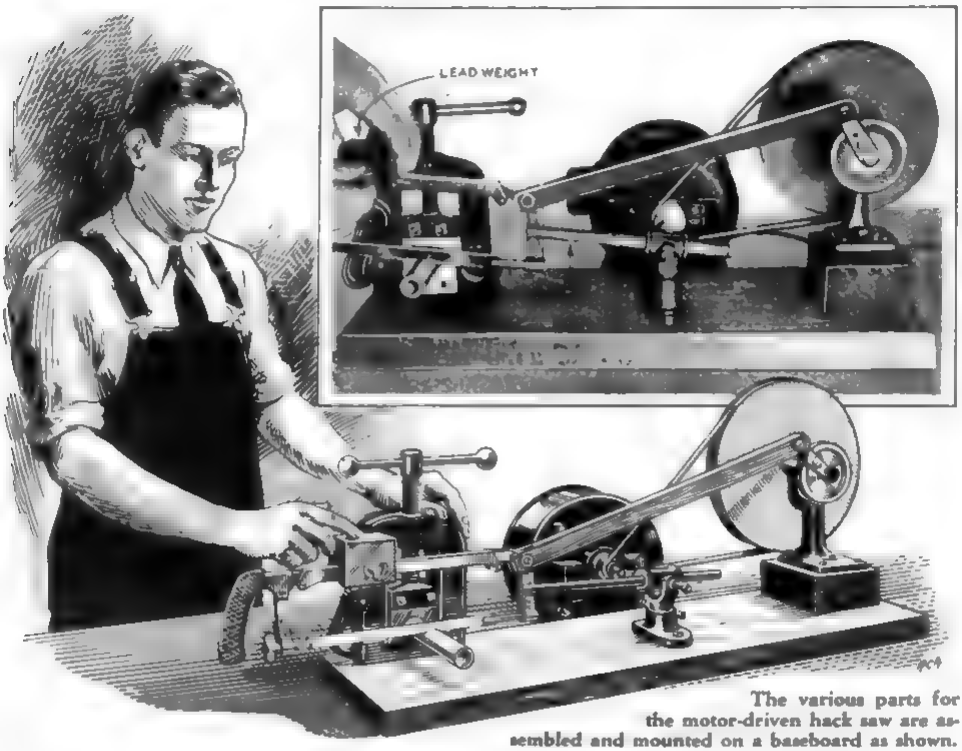


Because these metal tips for shoe laces aided convenience of lacing shoes, they were quickly adopted and brought wealth to the inventor.



Permitting the cloth umbrella cover to be folded up out of sight, this novel handle relieved people of inconvenience of carrying bulky umbrella and hence was soon much in demand on the market. When folded, as shown, umbrella looks like a cane.

Motor Driven Hack-saw



The various parts for the motor-driven hack saw are assembled and mounted on a baseboard as shown.

IF YOU have on hand a good ¼-horse power motor, you can build a very handy piece of equipment for your garage or home workshop—a motor-driven hack saw that will save you an immense amount of perspiration and effort when you have on hand the task of cutting metal stock. The parts are all easily made, and the completed device, minus hack saw and motor, of course, should not cost more than two dollars. Any fair-sized hardware store or machine shop will supply you with the necessary parts.

In addition to such odds and ends as bolts and washers, you will need a wood base, an adjustable hand hack saw frame, a length of ½-inch shafting, a wood connecting rod, a large wooden pulley wheel, bearings, a guide for the saw frame, and a small vise.

The base can be made from a piece of ¾-inch pine, the length depending on the size of the saw frame and other parts. The type of vise used for holding the stock also will determine to some extent the size of the base. In the model illustrated, a small pipe vise is employed, as most stock cut is of a round shape.

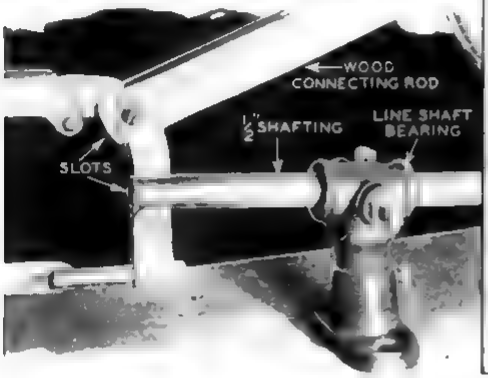
It is a good idea first to remove the handle from the saw frame, leaving only the metal piece that is necessary for holding the blade. Then cut a piece of ½-inch shafting about 6 inches long and fasten it to the frame at the point shown in the above photo. This is done by slotting the shaft so that it will slide over the frame, drilling a hole through the shaft and frame, and riveting the two together. The shaft then acts as a guide. It slides back and forth in a bearing that can be made up in any convenient manner. One of the best arrangements is to employ a small line-shaft bearing such as that illustrated. The bearing proper must be pivoted so that it will permit the saw to swing up and down.

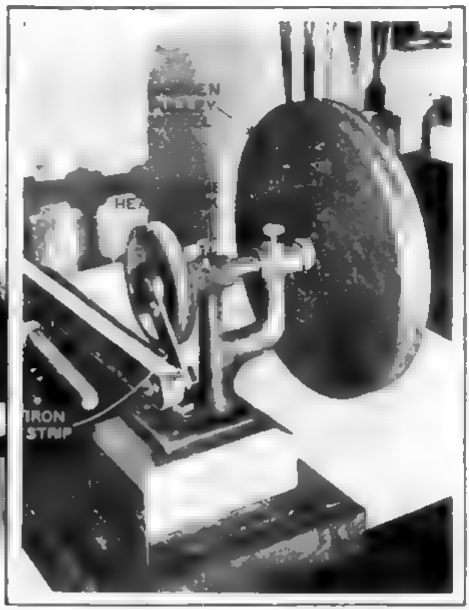
The mechanism that drives the saw back and forth consists of a large wood pulley

Saves Labor at Work Bench

by **WALTER E. BURTON**

Perhaps the most tedious task the workshop fan encounters is that of cutting metal stock with an ordinary hacksaw. By rigging up this simple device, however, you can stand by and look on while the motor does the work for you.





Above photos give details of assembly. The wood connecting rod and line shafting are slotted to fit over hack saw frame. The bearing is mounted in a pivot as shown. A piece of bar iron bolted to a small metal pulley makes the crank. The wooden pulley can be belted to either motor or line shaft.

wheel about 10 inches in diameter, mounted on a shaft that has, at the other end, a crank arrangement. The pulley wheel is turned from birch or maple stock ¾ to 1 inch thick. Make the V-shaped groove in it to take either a round or V belt.

To make the crank, bolt a piece of bar iron to the side of a small pulley, and drill a hole about 2 inches from the center to take the bolt that holds one end of the wood connecting rod. This gives the saw a 4-inch stroke. The bearing for the pulley shaft can be made by drilling a ½-inch hole through a maple block; but the best way is to employ a mounting such as that shown. This is a small lathe headstock that can be purchased, shaft and all, for one dollar, at any large hardware company.

The wood connecting rod is merely a strip of birch or maple that connects the saw frame to the crank. Its length is not critical, but it should not be too short. Wood is employed because it is easy to work and is quite durable. Of course, metal can be used instead. Methods of fastening the various parts together are shown in the accompanying photos.

Finally, it is necessary to provide some means of applying pressure to the saw blade. This is accomplished by means of a weight that is slotted and fastened with a set screw to the back of the saw frame. The size of the weight is best determined by experiment. Several sizes can be cast from lead, if desired.

In using the saw, do not operate it too rapidly. Use a small pulley on the line shaft, or motor, or a combination of pulleys if necessary. The frequency of cuts will depend on the nature of the material being sawed. A satisfactory plan is to employ about the same number of strokes per minute that you would use if you were cutting the material by hand.

Although a one-fourth horsepower motor has been recommended for driving the saw, a one-sixth, or even one-eighth h.p. motor may be used without danger of overload. Or if you have a line shaft available, you can utilize it. An oil drip for the blade will make a handy accessory.

Corner Windows Feature of New Gotham Skyscraper

The corner window construction of the recently completed skyscraper is shown in the photo above.

A NEW step in office building construction has been marked with the completion of a new 34-story skyscraper in New York City. The most noteworthy feature of the building is that the supporting steel framework does not extend to the corners of the structure, these corners being left entirely clear, and windows being placed at each floor with only a thin metal window sash at the angle. The additional light thus available in the corner offices makes these suites desirable especially in the upper stories beyond reach of street noises.

X-Ray Drives Screws in Tests

THAT X-ray waves have properties similar to bullets rather than waves has been demonstrated by Professor Perley Ansen Ross of Stanford University. By merely hooking up a little machine known as an X-ray spectometer and aiming it at a screw, he has been able to perform the task usually assigned to the lowly screwdriver. The machine costs about $5,000 so it will probably not become popular.

German Stratosphere Airplane

AN AIRPLANE with body, wings, motor and propeller designed for very thin air and with an airtight cabin in which the pilot and passengers can live comfortably even at heights of ten miles or more is being built by the Junkers works in Germany in an effort to break the height record for airplanes and with the hope that the atmospheric levels called the stratosphere, seven to twenty miles above the ground, may be opened to high-speed and long-distance flying.

The machine weighs about four and one-half tons, has a single motor and is equipped with air compressors of novel design both to provide the engine with necessary oxygen and to pump compressed air into the cabin so that the passengers can breathe.

Hands Free With Signal Lantern

J. L. LORBESKI of Minneapolis has recently invented a railway signal lantern which leaves the brakeman's hands free while switching for unloading freight, coupling air hose, climbing on cars, and other duties. The wire lamp guard is twisted into a loop through which the user may slip his wrist, holding the lantern firmly in any position of the arm.

Inserting the arm through the handle and loop holds the novel lantern securely.

Blimp Tows Aquaplane to Give Latest Aquatic Thrill

HITCH hiking behind the Goodyear blimp *Volunteer* is the latest form of water sport for thrill seekers on the California bathing beaches. One of the most ardent devotees of the sport is Elmer Peck, of Long Beach, holder of the world's record for endurance on an aquaplane. He is shown in the accompanying photo stunting on an aquaplane in tow of the *Volunteer* which is flying low over the water at a clip of 60 miles per hour. Stunting like this demands the utmost in nerve and skill.

Elmer Peck, aquaplane champion, stunting behind blimp "Volunteer" speeding at 60 miles per hour.

Tiny Lamp Outshines Giant Tube

SIZE doesn't seem to be the most important feature when it comes to candlepower in lamps, for the tiny photo flashlamp shown in the photo below is about three and one-third times as powerful as the larger one. However, the small one lasts only one-fiftieth of a second, while the large one lasts about a hundred hours.

Small bulb is 500,000 c.p., large one, 150,000 c.p.

Explains Why People Get Giddy

AN EXPLANATION of why so many people get giddy when they stand on high towers or at the edges of mountain precipices is supplied by Mr. Max Baker in the columns of the London *Times*.

The difficulty, Mr. Baker argues, is not due to fear of falling but is merely because the eye tries to focus on two things at once; on the distant landscape below and on the edge of the shelf or ledge on which one is standing. This produces the same kind of confusion that happens when the eyes fail to converge properly for any other reason, for example in some kinds of poisoning which also produce giddiness.

A curious fact pointed out by many observers and which is explained by Mr. Baker's theory is that few people are giddy when looking down from an airplane, although they may be higher than on any precipice and with far less support. This is due, Mr. Baker believes, to the fact that there is nothing to see but the ground far below. The eyes focus on the ground and are not disturbed. When one can see, in addition, the wall of the tower on which one stands or the steep downward slope of the mountain below one's feet, eye confusion happens and giddiness may be caused.

Hand-Powered Motor Boat Gives Real Watersport Thrills

The hand-driven crank on front of this watersports craft is connected to propeller on rear through belt and gears as illustrated. Buoyancy is provided by pontoons beneath the seat. Guard protects legs.

A DIMINUTIVE motor boat powered not by a motor but by a hand crank operated by the swimmer has been devised by a clever home craftsman to provide watersport thrills at the bathing beach. The propeller of this odd craft is geared to a pulley which is in turn belted to the hand crank on the front, as illustrated in the drawing above.

Buoyancy of the craft is increased by use of small pontoons fitted between the boards running lengthwise of the craft.

Experimenter Flies With Bat Wings

RESURRECTING an ancient theory of the Greeks which had to do with the flight of humans equipped with bird wings, Adolph Matz, an aeronaut of Brookline, Mass., recently gave a demonstration of a novel means of self propulsion through the air by the use of bat's wings.

Made of heavy cloth and braced with wooden ribs, the wings are strapped to the body as illustrated in the photo below.

Adolph Matz demonstrating human flight with aid of bat-like wings made of cloth and wood.

Gas Aids Capture of Wild Animals

WHEN the expedition dispatched by the Syracuse University to capture wild animals for the zoo goes forth into the jungle it will carry a big surprise for the victims. This surprise is a gas bullet, which when fired at a tiger, monkey, or other jungle beast, puts him to sleep without pain. When he wakes up he finds himself imprisoned behind the bars, wondering how he got there. The gas renders the victim unconscious, so that his capture is merely a matter of carrying him to a cage. Bullets containing a gas producing compound are fired from a large pistol similar to an ordinary revolver, and are capable of bringing down an animal at a distance of approximately 200 feet.

Things to Make with Tools

Edited by A. NEELY HALL

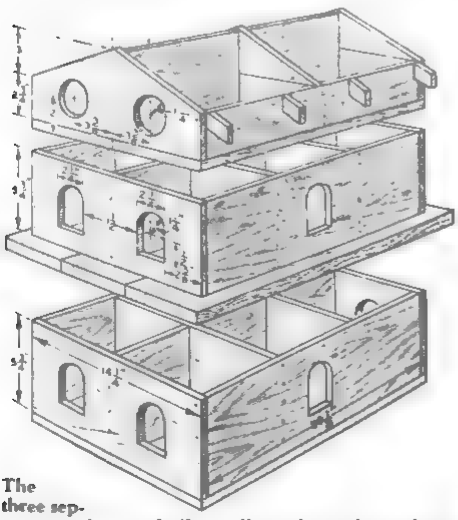
A Martin House with 16 Compartments

YOU will get more real satisfaction out of a house tenanted by martins than out of a house for any other species of birds. If they once take up residence in your structure, they will return each year and you will be amply repaid for your work.

The accompanying photograph shows an attractive martin house of sixteen compartments, enough to house a good-size colony of martins. The house is built in sections, one story to a section, to simplify the task of erecting and cleaning. The drawing below gives dimensions and the plan for constructing and assembling the three stories. Note that the job has a platform around the second story. Perches should be fitted to the other stories.

Stock ¾ inch thick is used in construction. First build the walls, locating the doorways as indicated in the accompanying drawing. Make the doors by boring several holes inside the outlines, then cutting out the wood between with a coping saw. The first and second story is partitioned off into six compartments as indicated, and the top story into four compartments. The various floors should be constructed separately, then screwed to the floor board, which also forms ceiling of the floor beneath.

The completed martin house ready for occupancy.



The three separate stories are built to dimensions given above.

The house in the photograph is shingled, with the shingles laid about 3 inches to the weather. Horizontal boards should be set between the center partition and the front and rear walls to support the shingles.

Finish the lower walls with a log veneering of straight branches of about one inch diameter. Drill holes through each piece to prevent splitting. Support the martin house upon a 6x6 post that will give it a height of about 16 feet. Paint the inside of each story section with one coat before assembling, and the outside walls of the second and third stories with two coats, preferably of green.

Bows and Arrows for

Archery is proving extremely popular at the beaches. Here an old chief is teaching bathers how to master the Indians' favorite weapon.

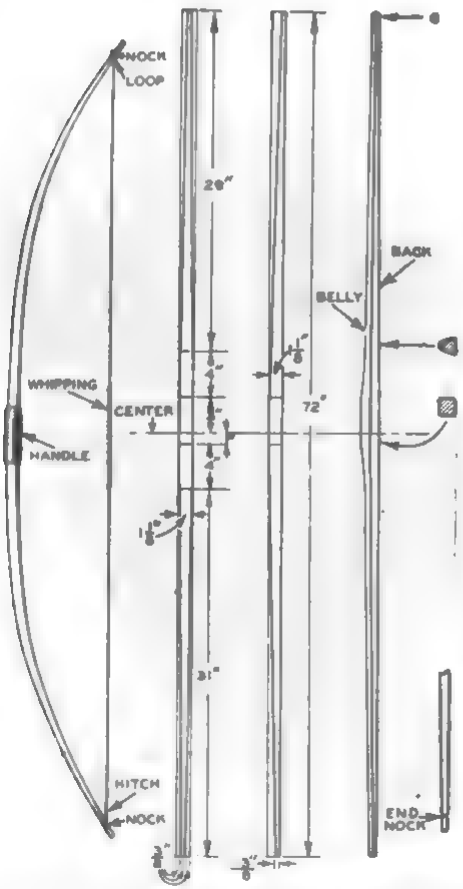


Fig. 1. The bow is shaped from straight grained stock, free from defects, to dimensions given here.

YOU will get a kick out of making a first class bow. It is not much of a trick when you know how. This data and the accompanying diagrams will set you right on the job.

The wood to be used for a bow must be of selected stock, free from defects, and must have straight grain. Yew is generally rated as first choice among woods, then osage orange, lemon, hickory and white ash, in the order named. Your local lumber dealer can probably get hickory or white ash for you and a supply house will furnish you with lemon wood staves.

Whatever wood you procure must be dressed to the dimensions 1⅛ inches square and 6 feet long, or from 3 to 6 inches longer than your height. Figure 1 shows the completed bow strung ready for use.

Having tested the stave for squareness, and trued up its surface if not square, locate the center of the length, and scribe a line around the four sides at this point. For the back of the bow, select the side of the stave which was nearest the bark of the log, if you can determine this from the end rings. Scribe one line across the back and another across the belly 7 inches above the center, and two more similar lines 5 inches below the center as shown in Fig. 1 to locate the start of the side tapers. Mark off the finished width on the stave ends, draw the lines of the tapers, then rip the stave close to the lines, and smooth the sawed surfaces with plane and sandpaper.

Amateur ARCHERS

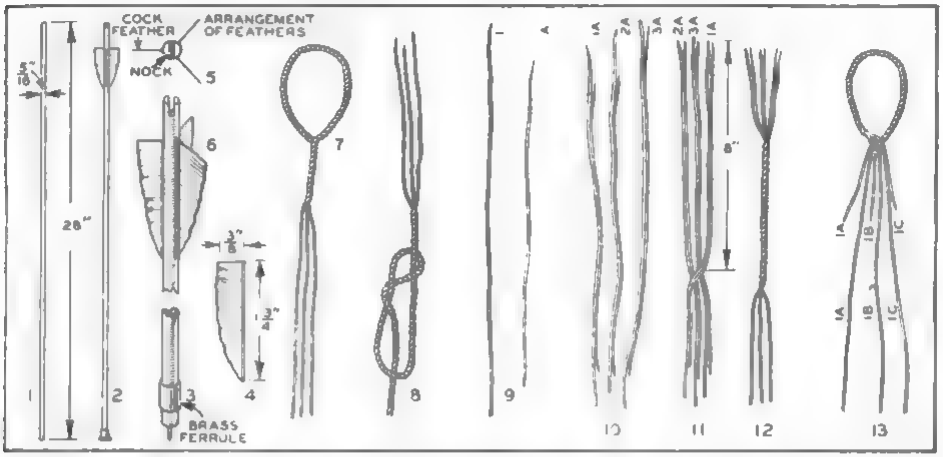


Fig. 2. Diagrams 1 to 6 show construction of arrow from dowel rod and turkey feathers. Loop and hitch at end of bow string are woven as illustrated in diagrams from 1 to 13. No. 8 shows timber hitch.

Next, draw the belly tapers on the sides of the staves, as illustrated in Fig. 1. Rip the stave close to the lines, and smooth the sawed surfaces.

The bow is now ready for the final shaping. Round the belly from the handle to the ends and remove the sharpness of the back edges with a wood-rasp. Then smooth the surfaces with No. 0 and 00 sandpaper. The drawing shows how to notch or "nock" the bow ends. Make the nocks with a rattail file.

Before applying finish to the bow, prepare the bowstring and test the bow's elasticity. If you find that the ends do not bend uniformly, trim off the stiffer end until a perfect adjustment has been obtained.

Build up the bowstring of shoemaker's No. 12 linen thread in the following manner. Make three strands seven feet long, of twelve threads each. Drive two nails into a post 7 feet apart, and run the thread back and forth over the nails until there are twelve lengths. Wax each thread with pure beeswax to make them stick together, then wax the finished strand. Prepare the other two strands in the same way.

Reinforcing the strand ends for the loop and hitch requires three strands 12 inches long, each made of six threads. Wax together the threads of each strand shown in diagram 9 as you did those of the longer strands. Taper these ends and the other strand ends by scraping with a dull knife. Then place the short strands along the long strands, as indicated at 1A, 2A and 3A in diagram 10, and wax each short strand to its long strand.

The next step is to lay up the ends of the three reinforced strands. Grasp the three reinforced strands with the left hand, at a point 8 inches from the ends as illustrated in diagram 11. Then twist strand 1A clockwise, and draw it towards you over strands 2A and 3A. In the same way twist the end of strand 2A clockwise, and draw it towards you over strands 3A and 1A. Continue the twisting and laying until enough length has been prepared for the loop as shown in diagram 12.

Form a loop amply large to slip over the bow end, and at the point where the loop closes wax each strand end to its respective strand, 1A to 1A, 2A to 2A, and 3A to 3A, as indicated in diagram 13. Then lay up the remaining lengths of the ends, as shown in diagram 7.

Separate the strands below the portion laid up, by combing out the twists with your fingers. Then lay up about 7 inches of the lower ends in the same way that you laid up the upper ends, but do not form a loop because the bowstring is attached at the lower nock of the bow with a timber-hitch, shown in diagram 8.

(Continued on page 195)

Build This Monorail

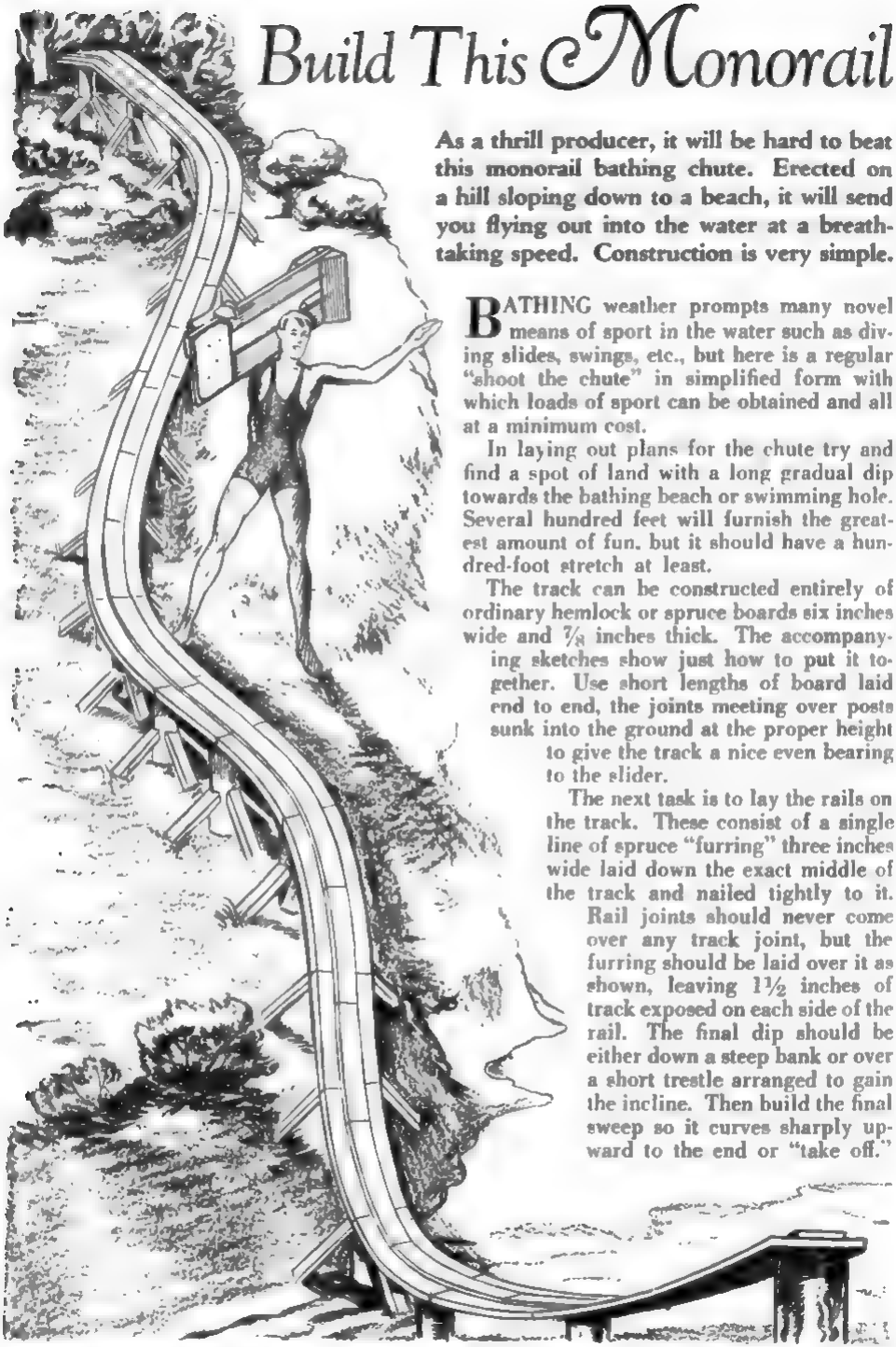
As a thrill producer, it will be hard to beat this monorail bathing chute. Erected on a hill sloping down to a beach, it will send you flying out into the water at a breath-taking speed. Construction is very simple.

BATHING weather prompts many novel means of sport in the water such as diving slides, swings, etc., but here is a regular "shoot the chute" in simplified form with which loads of sport can be obtained and all at a minimum cost.

In laying out plans for the chute try and find a spot of land with a long gradual dip towards the bathing beach or swimming hole. Several hundred feet will furnish the greatest amount of fun, but it should have a hundred-foot stretch at least.

The track can be constructed entirely of ordinary hemlock or spruce boards six inches wide and ⅞ inches thick. The accompanying sketches show just how to put it together. Use short lengths of board laid end to end, the joints meeting over posts sunk into the ground at the proper height to give the track a nice even bearing to the slider.

The next task is to lay the rails on the track. These consist of a single line of spruce "furring" three inches wide laid down the exact middle of the track and nailed tightly to it. Rail joints should never come over any track joint, but the furring should be laid over it as shown, leaving 1½ inches of track exposed on each side of the rail. The final dip should be either down a steep bank or over a short trestle arranged to gain the incline. Then build the final sweep so it curves sharply upward to the end or "take off."



For a thrilling ride, build the track as long as the hill permits, with as many curves and dips as possible.

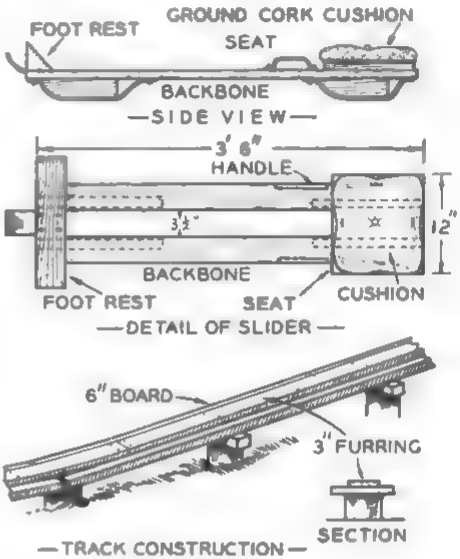
Bathing Chute for Thrills

The slider is very easy to construct. Cut off two pieces of three-inch furring 3 ft. 6 in. long and lay parallel 3½ in. apart. Connect the front end by a piece of 4x4 timber 15 in. long split diagonally down its length as illustrated. Then connect the rear ends of the parallel strips by a board 12 in. square for the seat. On top of this fasten a cushion made of heavy canvas and stuffed with ground cork taken from a grape keg. Two handles are arranged as shown.

Turn the slider over and then attach four hard wood blocks to the under side of the parallel strips as shown, two at the front and two near the rear end. Set them back slightly from the inside edges and fasten with long screws driven in from the top. Then shoe each block with smooth iron, countersinking all screw heads. When completed, give all but the cushion and iron runners several coats of good paint. Then attach a piece of sheet steel under the footrest and curve it slightly to act as a guard to ride over any protruding joints of the track.

Now go over the track thoroughly, driving down any projecting nailheads and smoothing off knots, slivers, or any projections that might cause interference. Give the entire structure two or three coats of linseed oil, and after it is dry wipe the entire surface of track and rail with candle stubs. This lubricates the wood and increases the sliding qualities.

Shine off the runners of the slider with fine emery paper to make them smooth and then treat the under surfaces with paraffine.



Details of construction of slider and chute are shown above. The track is lubricated with tallow.

Combination Glider and Sled for New Coasting Thrills

Loretta Young, film star, about to take off on new sled-glider.

THE thrills of both gliding and coasting are produced by a new sled-glider recently devised for the amusement of Hollywood stars when they take time off from the studios for winter sports at Lake Arrowhead, Cal. With this new sled-glider, which amounts to airplane wings mounted on a trestle above a pair of runners, the coaster-pilot begins his run at the top of a hill, and then takes off for short jumps when the device gains sufficient momentum. Loretta Young, film star, is shown in the photo getting set for a hop on her sled-glider.

Bad Light Causes Bridge Quarrels

BAD light, illuminating engineers claim, is at the root of the family quarrels which start at bridge games. The inadequate lighting causes a strain in the eyes, which in turn causes the players to become irritable and even violent when a partner trumps an ace.

Hockey Now Becomes Miniature

AND now hockey has been miniatured and steps forth as a game played on a table, the players using two undersized hockey sticks to bat the ball in small holes at the end of the rink. The game has become extremely popular with Mickey Walker, middleweight boxing champion, who is shown in the photo below indulging in a game.

Mickey Walker and Jack Kearns take time out from training to play miniature hockey on table.

Study Stomach Through Window

By means of window in side of cow, as shown here, scientists were enabled to study unaccountable formation of vitamin B in the cow's stomach.

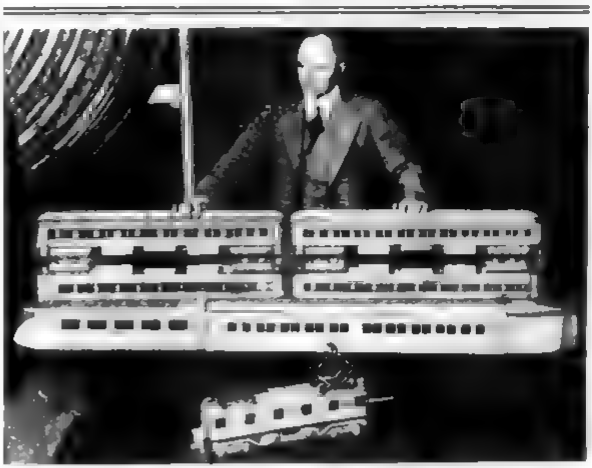
COWS with windows in their sides, exposing their stomachs, is the means that bacteriologists at Pennsylvania State College are now employing to study the secret of the formation of vitamin B in the rumen of dairy cows when no vitamin B is fed to them in their rations. The experiment proved a success in every way, and seeking to gain more knowledge, the professors installed a window in a second cow, who was named Jesse II, in honor of her predecessor, Jesse I.

But Jesse II had one distinction that Jesse I had not—she became a mother, proving that the window in her side was in no way injurious to her physical well being, and in addition providing an heir to carry on the experiments. Jesse II is shown with her offspring, Jesse III, in the photo above.

Streamlined Models Show How to Build Faster Trains

APPLYING the principles of aerodynamics to the extremely important field of railway transportation, research engineers at the Westinghouse laboratories, using models of present type and streamlined cars, are working out new designs for high speed trolley cars in which wind resistance is reduced to a minimum.

Using the well known wind tunnel blowing blasts up to 80 miles per hour, engineers have found that streamline design effects a saving of 13 per cent of total horse power when a car is travelling at a rate of 35 m.p.h., and 32 per cent at 75 miles per hour. These findings point to the fact that in future our fast interurban cars will no doubt look like long slim zeppelins streaking along.



Dr. Oscar G. Tietjens, research engineer, with model cars used to determine effects of streamlining for increasing speeds.

Here is the new tear gas cartridge and tear gas gun resembling sawed off shot gun which was found highly effective in recent tests in Boston.

Tear Gas Gun Highly Effective

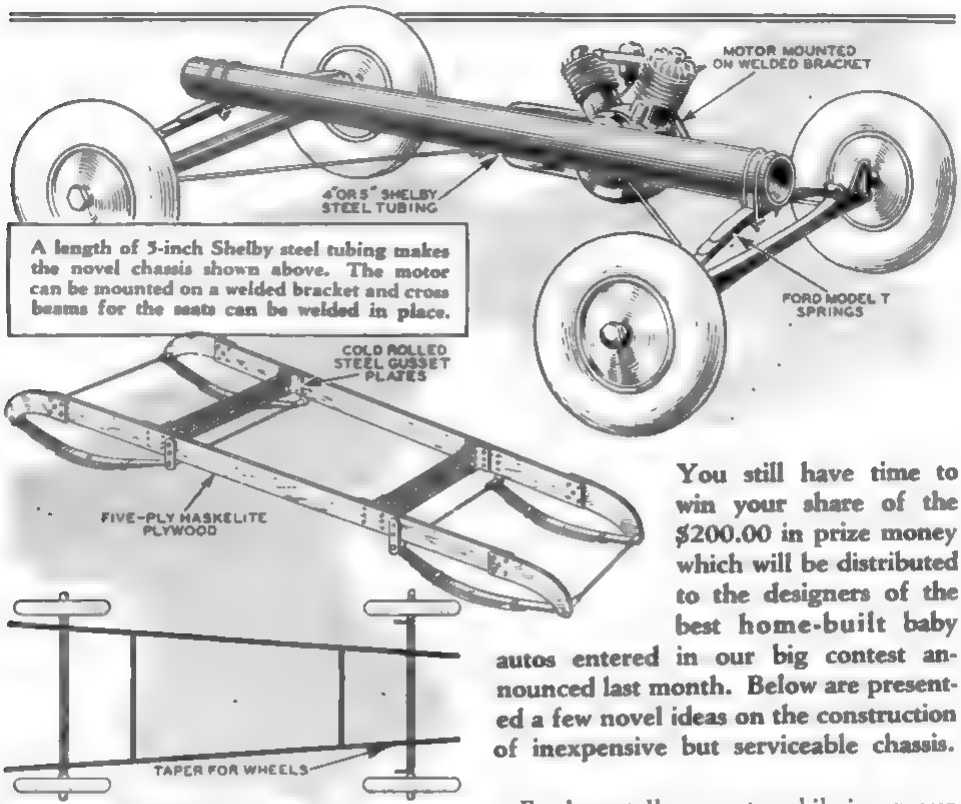
FELONS of the future will find life a sad tearful affair when the new tear gas gun, recently tested out by the Boston police force, gets into action. This new gun, shown in the photo at the left, resembles a sawed off shot gun, and fires a bullet filled with gas which is so overpowering that it will dislodge the most hard-hearted criminal in less than two minutes.

Preventing Smoke Rot in Clothes

WHAT laundries call "winter damage," the rot which afflicts clothes hung outside to dry in winter weather, has been traced to smoke acids absorbed from the air. This damage may be decreased, if not eliminated altogether, by rinsing the clothes in a weak solution of calcium bicarbonate, a chemical related to baking soda, before hanging them out to dry.

Nearly all coal, oil, and similar fuels contain small amounts of sulphur, which passes off in the smoke in the form of sulphur dioxide gas. This sulphur dioxide is absorbed by damp cotton fabrics and is then oxidized into sulphuric acid. Sulphuric acid eats into the fibers and weakens the fibers. The action of the calcium bicarbonate left in the clothes by the rinse water neutralizes the erosive action of sulphuric acid and prevents damage to the fabric.

WIN a CASH Prize With



A length of 3-inch Shelby steel tubing makes the novel chassis shown above. The motor can be mounted on a welded bracket and cross beams for the seats can be welded in place.

Haskelite plywood, gusseted together with steel plates, makes a good chassis, imitating the shape of a conventional frame.

You still have time to win your share of the $200.00 in prize money which will be distributed to the designers of the best home-built baby autos entered in our big contest announced last month. Below are presented a few novel ideas on the construction of inexpensive but serviceable chassis.

HEAR that rapping on the door? It's Old Lady Opportunity knocking at the workshop of you fellows who are building home-made baby autos—she wants to warn you to be sure to enter the auto-building contest announced in the June issue of MODERN MECHANICS AND INVENTIONS, in which $200 in cash will be distributed among the winning contestants. There's still plenty of time for you to build a speed-wagon and get into the game. On the opposite page the rules of the contest are reprinted.

Now we're going on to give you a few tips on novel ways of building a chassis for your car. The contest entries don't have to make use of these ideas, understand—they're simply presented to show you what you can do in the way of making ingenious use of scrap parts.

Fundamentally, an automobile is a power plant on wheels capable of self locomotion. The parts needed for such a machine are wheels, a frame for carrying the wheels and upon which frame is mounted the power plant. Everything from a Rolls-Royce to a home-made cyclecar is covered by this definition.

It is in the assembly of these various parts into a small auto that the greatest play for inventive ability can be found by the amateur mechanic. MODERN MECHANICS AND INVENTIONS here suggests many ways of taking odds and ends of material, or parts of discarded bigger cars, and putting them together to make a useful car of your own design and build.

As a starting hint, let us look at the problem of what to use for wheels. Everything from old Ford wheels to bicycle and small airplane wheels suggest themselves. These are good, and have been adapted to many cars of home manufacture. Ford wheels can

Your HOME BUILT Auto

Here's an ingenious car built by Gayle Lockhart, of Los Angeles, Cal. It can carry three persons at 63 m.p.h. Assembled from scrap motorcycle and auto parts, it cost only $18.

be bought for a song. Their chief drawback, when considered for a small car, is their "off scale" size. They are big, ungainly, and out of proportion on a diminutive auto. Bicycle wheels are hardly strong enough. They have a tendency to buckle and to throw tires on any but the most gentle turns. You and I want a little car we can pound on the back!

Airplane wheels are good, as they are strong and can be had in any size from 14"x3" up. The tires and tubes for these wheels are in reasonable accordance with standard tire prices.

Most car frames today are made of channel steel, securely riveted and gusseted so as to be rigid. Steel is out of the picture for most small car builders, but have you thought of taking a piece of 4" or 5" Shelby steel tubing and using it as a chassis? The motor can be mounted by welding a bracket to the tube, cross beams for the seats can be welded on, and the whole thing sprung from either end with springs taken from a Ford Model T car with every other leaf removed to soften up its action.

Such a frame does away with the need for tapering a parallel-depth two member frame as must be done in the conventional type, to allow turning freedom for the wheels.

Another good suggestion for the built-up type of chassis is to use 5/8" four or five ply Haskelite plywood gusseted together with cold rolled sheet steel plates, imitating in form (except for channeling) the conventional method of building up a frame.

Plywood is good to use in this connection. It is lighter than steel per unit strength; stronger than steel per unit of weight.

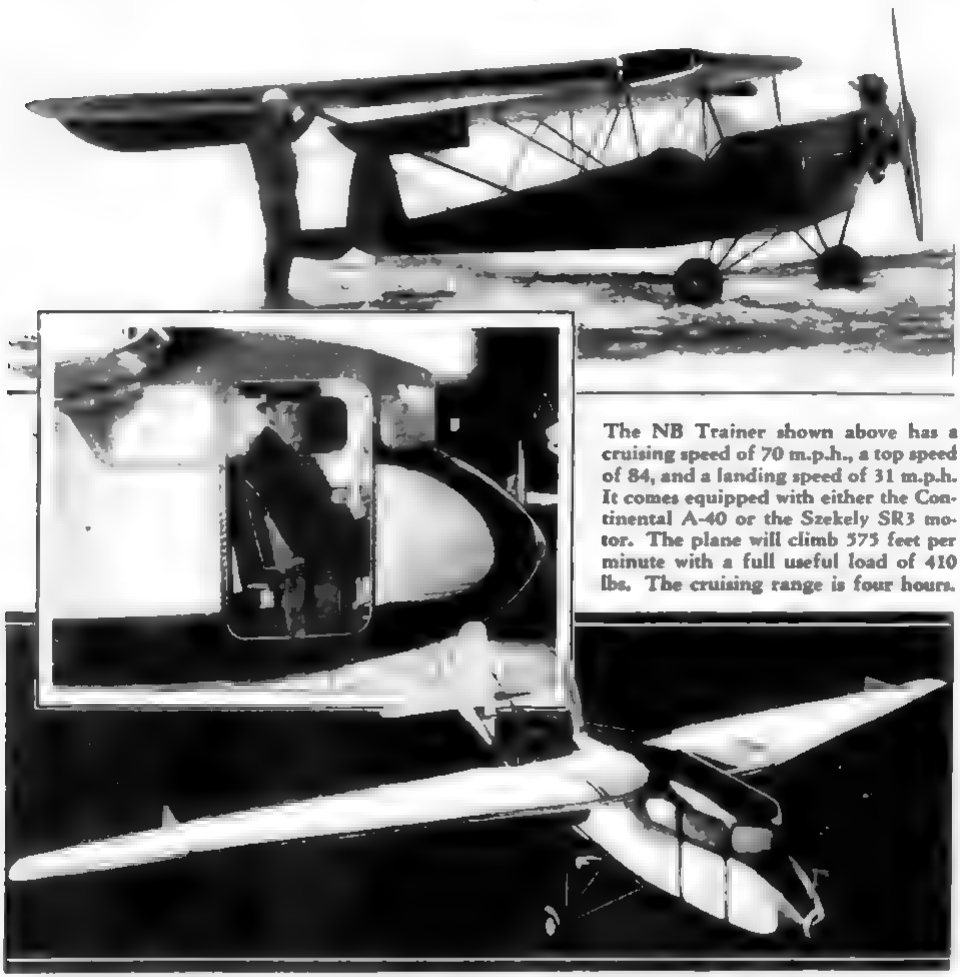
Motors? The most logical motor for a small auto is the motorcycle motor. These usually come with transmissions, so that all that is necessary to make an auto is to build the frame, wheels, and furnish a jackshaft or countershaft so that the power take-off can be effected. The Harley, the Indian, and others come with this type of drive.

The Henderson four-cylinder should make a snappy power plant, too. It is as complete, as used in the motorcycle, as the average auto motors. As with the others, the only added

(Continued on page 189)

CONTEST RULES—For photos of the best home-built baby autos, powered by gasoline engines of not more than four cylinders, accompanied by brief descriptions of construction and statement of speed developed, Modern Mechanics and Inventions will award a first prize of $100, a second prize of $50, a third prize of $25, and five fourth prizes of $5 each. Decisions of the judges are final. Photographs or manuscripts will not be returned unless a stamped, addressed envelope is enclosed. In case of ties, duplicate prizes will be awarded. Anyone may compete except employees of this magazine, or their families. It is not necessary to buy a copy of this magazine or to be a yearly subscriber. Photographs and manuscripts should be submitted in the same envelope, and photos should bear return address on the back. Entries must be postmarked on or before August 1, 1931. Address Auto Contest Editor, Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn.

Sky Flivvers for the Private Owner



The NB Trainer shown above has a cruising speed of 70 m.p.h., a top speed of 84, and a landing speed of 31 m.p.h. It comes equipped with either the Continental A-40 or the Szekely SR3 motor. The plane will climb 575 feet per minute with a full useful load of 410 lbs. The cruising range is four hours.

Above are shown two views of the Stout metal "Sky-Car," which is powered with a 75 h.p. Rover motor. Many safety features are incorporated into this plane, including balanced floating wing-tip ailerons.

MODERN MECHANICS AND INVENTIONS, which has been from the first issue among the pioneers in popularizing the light plane is pleased to note that several leaders in the aviation industry have placed light planes upon the market which are so low in price and so easy to operate that they are easily within the reach of the ordinary individual who is able to own and operate a car.

The Stout "Sky Car" is an all-metal, high wing cabin tandem seater pusher airplane with a three-wheel landing gear. The engine is placed behind, so that the noise is no greater than that of an auto traveling at equal speed. Danger of fire is also eliminated, as the engine is behind a fire-proof and sound-proof wall.

The NB Trainer is a high wing, semi-cantilever monoplane which will not fall off from any stall position nor voluntarily spin. It can be hangared in a space 11x23 feet, due to its folding wings. This plane comes powered with a Continental A-40 or a Szekely motor.

MOTOR MECHANICS

Edited by RAY F. KUNS

Getting More Speed from Your Car

Balance—And What It Means to the Racing Auto

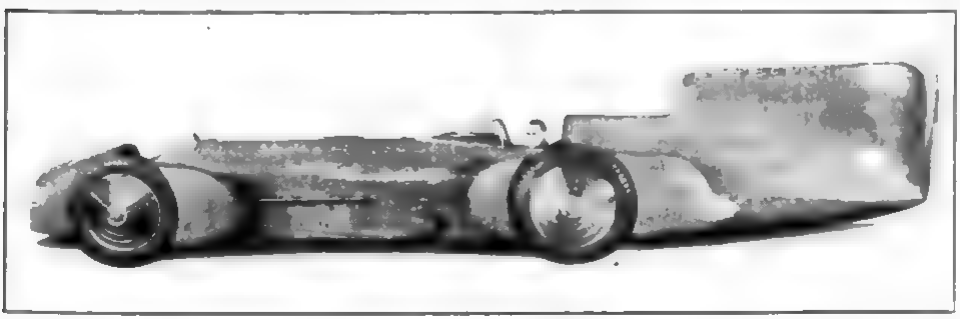
SPEED holds a very definite lure for thousands of red blooded American youths. The question of how it is possible to rebuild a worn out automobile engine into a real speed creation is one interesting more and more enthusiasts.

Captain Campbell's 245.73 miles per hour intrigues all of us. We hear much talk of 90 miles-per-hour cars. Most of these are creatures of our imagination. As a matter of fact there are very few stock cars on the road which will clock 90 miles per hour, even under the most favorable conditions. Of one thing you may be certain. Cars which do perform in excess of 60 miles per hour have certain characteristics which are essential to speed. Perhaps the most important of these is balance. It is impossible to rev up an engine which is badly out of balance. The vibration set up within the engine consumes all of the power developed beyond a certain critical point. How to eliminate this vibration is one of the first problems which must be mastered by the builder of a speed creation, whether it be a motorcycle or automobile.

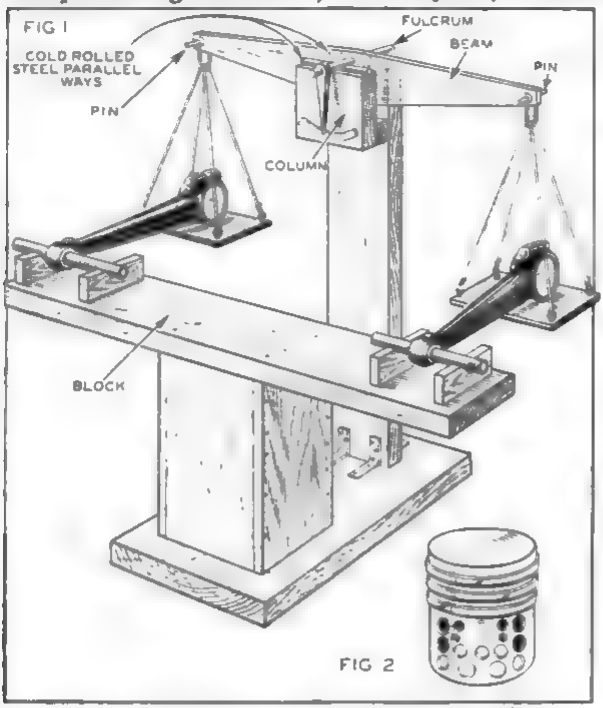
The thing every would-be builder bumps into is how to balance reciprocating parts. The ordinary household scales will not serve. They are not accurate enough. The price of a pair of scales which will serve is usually $50 to $100, the best scales costing considerably more than this. It is possible, however, for the ingenious mechanic to improvise some form of balance which will serve nicely for the job he has to do. A scale is something which will weigh and record in pounds or fractions thereof. A balance need not be a recording scale, although it might be extremely accurate.

The illustration reproduced herewith will give an idea of how you may proceed to improvise a balance which will show you whether all similar parts are of exactly the same weight. Many variations of this device are possible. A prime requisite is that no design be used which allows for any friction of the beam or the fulcrum on which it rests. For this reason it is suggested that the parallel ways, on which the fulcrum of the weighing beam rests, be made from cold rolled steel. Two of these are laid absolutely level on the top of the column. Another one, passing through the center of the beam, is laid on them. This you see makes a point of contact without friction.

See that the distance from the center of the fulcrum to the ends of the beam is exactly the same in each case. Also see that the point at which the pins pass through the beam at



Streamlining and power would have been useless on Malcolm Campbell's car without perfect balance.



Accurate scales for balancing the reciprocating parts of a racer are expensive, but the work may be done on this simple, home-made balance at practically no cost if instructions are followed.

the end are absolutely equidistant from the center. If this is worked out to a nicety it will be possible to so balance two connecting rods that they may be moved from end to end of the balance and register absolutely perfect balance in either position. However, if you have the least variation in the distance between the fulcrum and pins this cannot be done.

When doing the work of balancing first set up the big ends of the rods, as illustrated, and balance one against the other. Having brought two into balance, remove one and proceed to balance another one against the first one and continue until all the big ends have been balanced.

Next place the big ends on the block and the small ends on the balance. Work on these until they too are in absolute balance. Next place the entire rod on the balance and balance one rod against the other and continue this until any one of the set will balance any other one of the set.

Next proceed to balance the pistons, one against the other and then the rings and pins. Finally balance the entire piston assembly, less the rod, one against the other. When the connecting rod and piston assembly has been made, balance these again, and prove them.

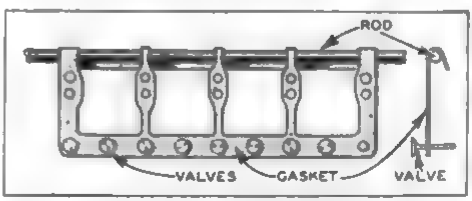
While you do not know the exact weight of these units you do know that they are in just as perfect balance as they can be brought into.

The question ofttimes arises as to where to remove weight from a piston or connecting rod. The pistons may be drilled, as suggested in Fig. 2. The connecting rods should be filed at the point from which it is desired to remove weight. Sometimes it is possible to scrape away a bit of the babbitt metal at a point where no harm will come of it, thus reducing the weight of the big end. When the rods are finished, they should have been filed and polished bright on practically the whole of the outer surface. No irregularities should appear on them. Two pounds of weight on a reciprocating part, such as a connecting rod, means almost a ton of energy to be dissipated each time the connecting rod or piston assembly is stopped at the end of the stroke and started again.

One young man who balanced piston assemblies on a home-made device, reports that he later weighed them on a very fine scale and that the difference in total weight was so slight that the balance was almost perfect.

Finding a Use for the Old Gasket

IF YOU are discarding the old cylinder head gasket when you grind the valves, it may be used as a means of supporting the valves and keeping them in order. Hang it on the radiator-to-cowl stay rod and slip the valves through the cylinder bolt holes.



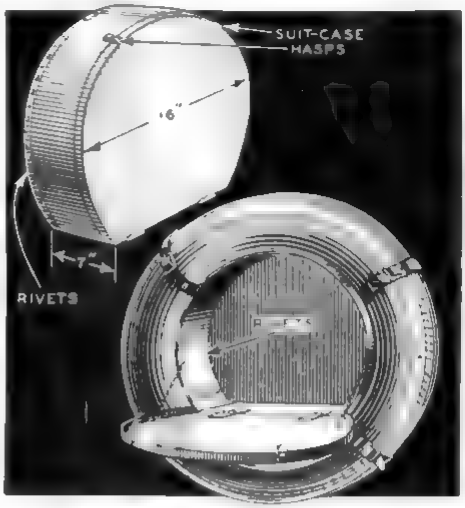
An old gasket hung on the radiator-to-cowl stay rod may be used to keep valves in order.

Building a Handy Metal Cabinet in the Spare Tire Rim

MANY cars are now provided with spare tires, carried in the fender wells. An aluminum cabinet may be built for this space which will afford storage for the wash pan, towels and similar camping paraphernalia. The job is designed so that when it is opened the lid becomes a wash stand.

The first thing is to determine the outer diameter, which should be approximately one inch or less than the inner diameter of the tire rim. It will also be necessary to cut off the bottom of the cabinet so that it will clear the valve stem.

The lid and back of the cabinet are made from sheet aluminum with a flange turned over. The flange of the back is riveted to the side of the cabinet which has been formed up to just fit into the tire rim. The lid is hinged to the flat portion of the cabinet at the bottom and is supported in a horizontal position, when opened, by means of two aluminum chains. When closed the lid is held in position by means of two suit case clasps. In order to support the cabinet within the tire rim, four leather straps may be used, these being attached to the cabinet by means of short strips of metal riveted to the cabinet through which the straps may be passed to buckle around the tire.



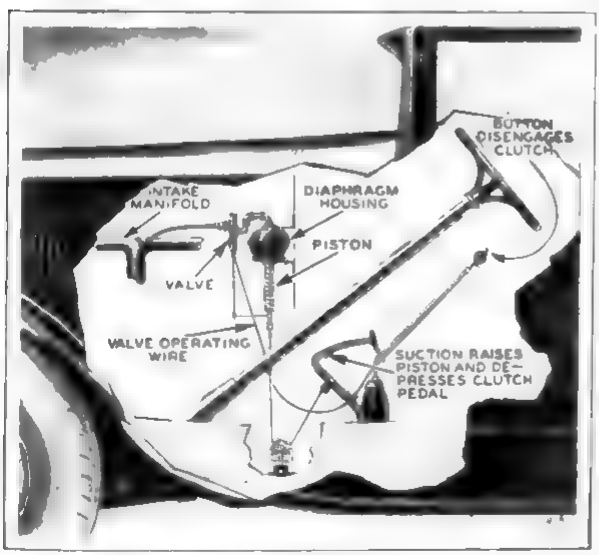
An aluminum spare tire cabinet for holding camping equipment. The dimensions given here are examples only, and the diameter and depth should be governed by the size of the tire rim.

Vacuum Clutch for Lazy Drivers

AUTOMOBILE driving, formerly classed as a minor athletic feat, is rapidly approaching the point where only a machine which can read the driver's mind and translate his thoughts into immediate action can make driving much easier.

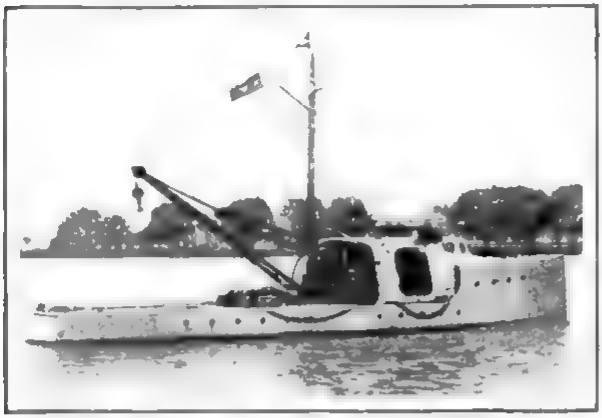
The latest boon to lazy drivers is the power-operated vacuum clutch which may be installed on any car. When the gears are to be shifted the driver may now forget the clutch pedal, merely pressing a button on top of the knob as he grasps the gear-shift lever. The car may also be permitted to coast by holding down the button. When this button is released, the clutch takes hold smoothly and automatically.

The clutch is operated by vacuum created in the intake manifold. When the button is depressed it opens a valve, the suction raising a piston which depresses the clutch pedal. Releasing the button closes the valve and permits the spring to return the piston and clutch pedal to normal positions.



When the button is pressed, a vacuum is created in the chamber, raising the piston and depressing the clutch pedal. A spring returns the piston, releasing the tension on the wire.

Rivetless Boat Retrieves U. S. Army Air Service Seaplanes



This photo of the Army's first seaplane retriever shows the after deck close to water line and almost entirely unobstructed.

THE first o. a new type of craft, known as a seaplane retriever, has recently passed tests by government officials and has been put into service by the United States Army Air Service. This forerunner of a fleet of such craft is especially designed as a rescue ship for aircraft which may require assistance after alighting from their natural element upon the waters.

This boat has a large unobstructed deck aft, with a low freeboard. Amidships is a powerful boom for hoisting the disabled aircraft aboard, while the hoisting machinery is installed in the deck house. In the forward cabin is found a small first aid station where injured pilots may be given emergency treatment. The boat was constructed by welding.

Non-Fade Wall Paper Now a Fact

AMERICAN chemistry has scored another triumph with the perfection of a wallpaper which exhaustive tests have proved to be just that. The paper was tested in the Fade-O-Meter for 36 hours without any sign of fading; a test equivalent to exposure to normal sunlight for two years.

E. D. Belknap, Executive Vice-President of the Wall Paper Association, testing non-fade paper.

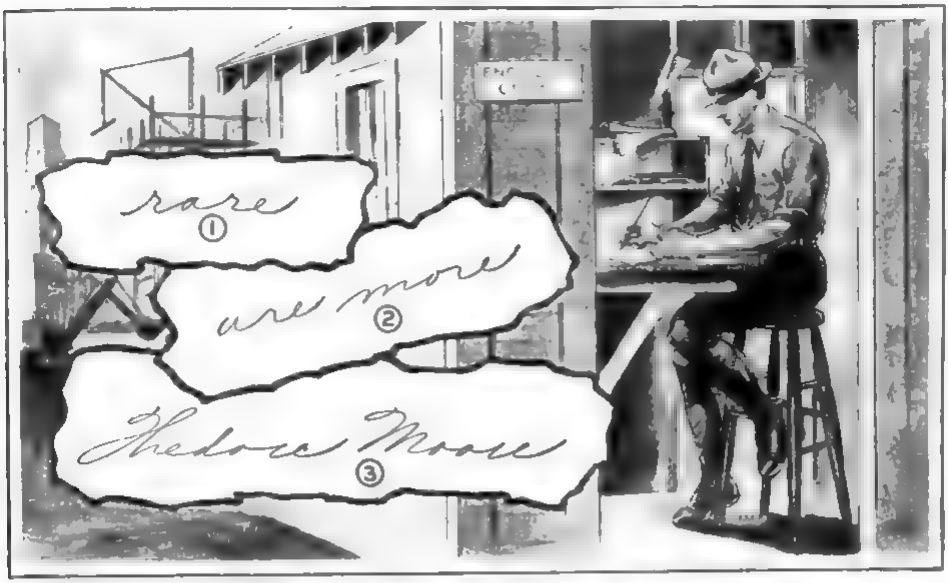
Mallet Golf Club Stops Slicing

A NEW type of golf club, which the inventors claim will invariably send the ball straight ahead instead of off on an angle, was only one of the interesting devices revealed at the recent International Patent Exposition at Chicago.

This odd cure for hooks and slices resembles a blacksmith's hammer mounted on the tip of an ordinary steel golf club shaft. The various wood and iron clubs are lofted at the same angle as those of the corresponding conventional divot-digging implements now in use the world over.

Josephine Shimkus demonstrating new golf club.

Free Analysis of Your Handwriting



If you wish to learn whether you have latent capabilities as an engineer send M. N. Bunker, care of Modern Mechanics, a specimen of your handwriting for a free analysis. Specimen No. 1 above reveals an engineering nature, No. 2, a nature with leanings toward engineering, No. 3, a curious, studious nature. These characteristics are revealed by the shape of the small letter "r."

MR. M. N. BUNKER, world-famous grapho-analyst, after exhaustive study of thousands of specimens of handwriting, has found that there are three distinct variations of the smaller letter "r" and that they are of very great importance in determining the natural fitness a man may have for one particular type of work.

If the small "r" is made with a flat top like the one in specimen No. 1, you have a natural born builder, a man with engineering type of nature. This is clearly expressed in the handwriting of such men as Steinmetz, that famous wizard of the electrical world, or Edison, who has accomplished such remarkable feats of invention. The signature of President Hoover shows the same "r." Each of these men has achieved success in some field of engineering, and show the talent for building and creating in the way they make their "r's".

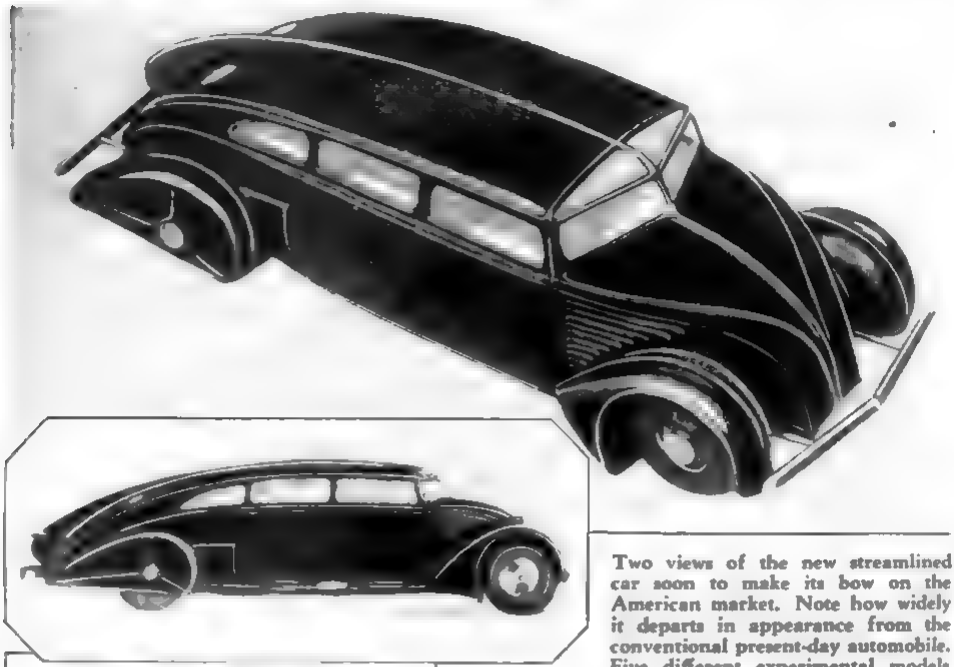
Such a writer is a constructive type of thinker. He gathers material and ideas, and builds up to a finished conclusion, just as a contractor gathers together his steel, and brick, and cement before he starts building.

If he makes his "r's" with a rounded curve as in specimen No. 2, you have a man with *leanings* toward the engineering field, but not a definitely established talent for such work. A man of this kind who is given careful training will master engineering, osteopathy, or some other profession that requires skill in the use of his hands. Such an "r" however shows a nature that is not definite in thinking. Such a writer may be easily influenced by people or circumstances.

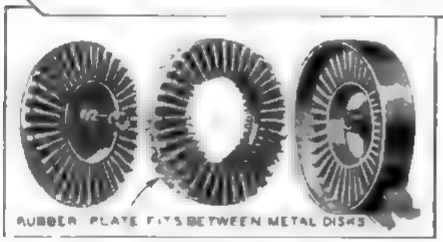
If you find a writer making his "r's" pointed as in No. 3, you have a man or woman who is curious, eager to learn things. They are investigators, interested in finding out about things in general. Such writers are rapid thinkers, quick in forming conclusions, and do much better work where much mental effort is required.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting, to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

Streamlined Rear-Engine Car



Two views of the new streamlined car soon to make its bow on the American market. Note how widely it departs in appearance from the conventional present-day automobile. Five different experimental models have been built.



The Adams suspension unit, shown above, requires no lubrication, consisting of a rubber plate fitted between geared disks.

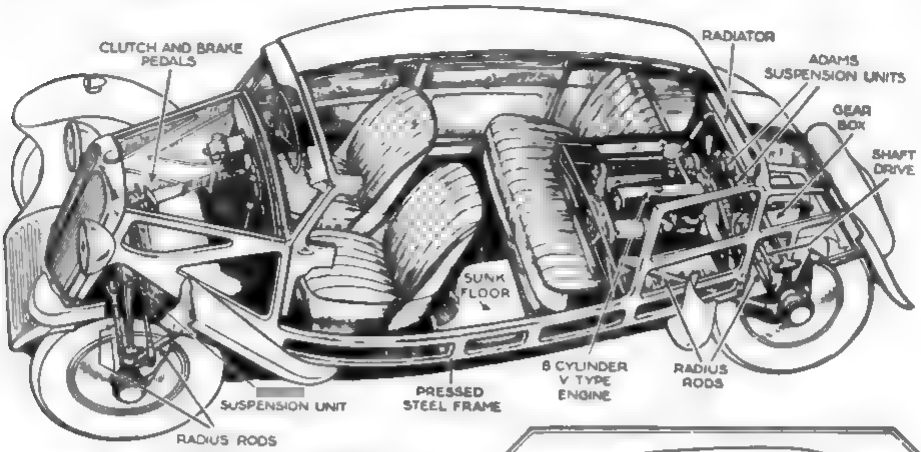
REVOLUTIONARY features in motor car design, including such innovations as hydraulic steering and a streamlined body with the motor at the rear of the chassis, are embodied in an automobile designed by John Tjaarda, associated with General Motors Corporation. Tests of the novel car are now being carried out, and it is likely that the streamlined automobile will be put in production shortly. Prices of the car in various models, based on the cost of various experimental types, are expected to be remarkably low, ranging from $700 to $1800.

Advantages of the rear-engine type of construction include such features as freedom from noise and engine fumes and heat, more body room, adjustable road clearance, better dynamic balance permitted through elimination of the conventional drive shaft, and improved body suspension.

All four wheels of the car will be independently sprung. This is a feature of design which will no doubt soon be adapted by manufacturers of conventional type cars, many of whom are now experimenting with the idea.

Hydraulic steering gear of simple construction permits the steering wheel to be located on either the left or right side of the driver's seat so that the car can easily be adapted to export markets where right-hand drives are popular. The chassis is hung from Adams suspension units, which are ingenious rubber mountings giving the utmost in flexibility and strength. As illustrated in one of the accompanying drawings, this unit consists of two toothed disks, between which fits a plate of rubber molded to fit. Lubrication is thus unnecessary, and the unit is noiseless at all times.

Designed for American Market



Mechanical details of the car are strikingly shown in this drawing. Placing of the motor at the rear enables the space under the hood, usually reserved for the engine, to be devoted to leg-room for front seat passengers.

It is interesting to note that the streamlined car follows along the line of development predicted in the February issue of MODERN MECHANICS AND INVENTIONS. There is nothing strictly original in the idea of a streamlined car, nor in the mounting of a motor at the rear, both of these features having been incorporated in a British automobile designed by Commander Burney of the dirigible R-100 some months ago. But the adaptation of the idea to the American mass market, involving the production of thousands of cars, is a new development. It is not improbable that the flivver of ten years from now will resemble the photographs reproduced on these pages.

Until the perfection of air-cleaning devices, the mounting of the motor at the rear of a car suffered from the inevitable disadvantage of being forced to breathe dust-choked air through its carburetor, causing the motor to wear out too quickly. Some of the first automobiles, twenty years ago, had their motors mounted at the rear, and many of us can remember the days of the "side winder" which was cranked on the side of the car.

Although designer Tjaarda is associated with General Motors, the promotion of the streamlined car is being carried on by a small group of automotive engineeers and manufacturers who will probably place the car on the market as an individual corporation.

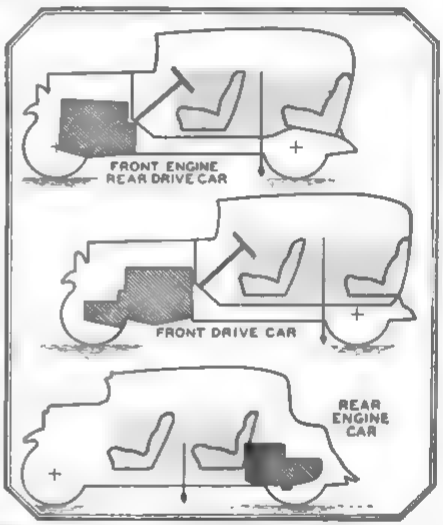
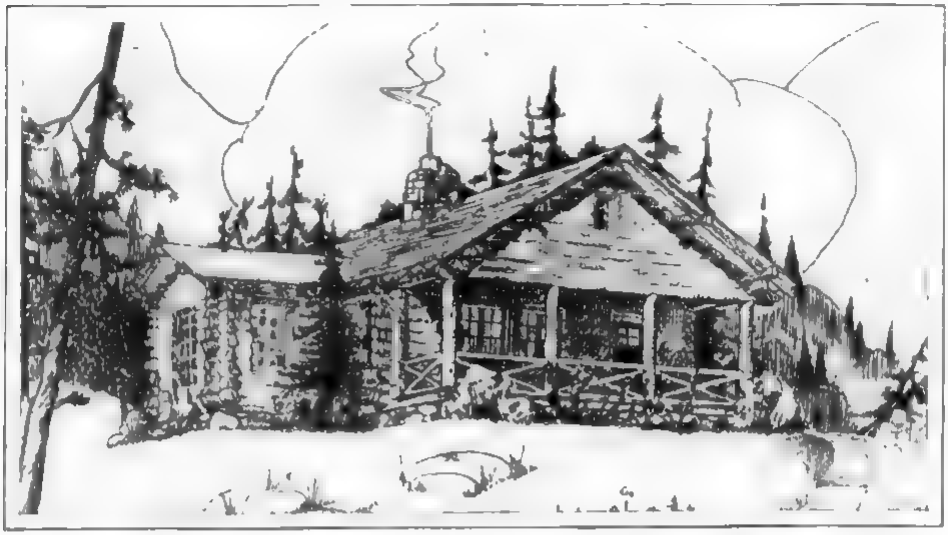


Diagram shows how center of gravity in a rear-engine car is practically at the chassis center.

Commenting on the new car Mr. Tjaarda says:

"Interest prevails at present for rear-engine cars, and for good reasons. The present-day car has almost attained its height of perfection. If streamlining is going to take seriously in the near future as is predicted the arrangement of our cars today affords so many difficulties that it is not worth while to consider such a step. For many years to come there will remain an active market for the type of cars to which we are now accustomed with progress having its way. However, there is no doubt that the rear-engine car is the car of the near future."

Cabin Days are Here Again



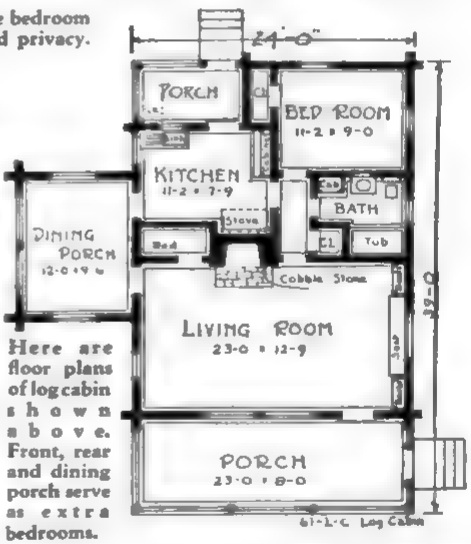
This picturesque log cabin, Plan No. 61-L-C, has one bedroom but can accommodate ten people with comfort and privacy.

by **MAURICE I. FLAGG**
Director, Small Homes Bureau

There's no greater summertime joy than having a log cabin or summer cottage to which you can repair for week-end vacations. Here are two plans, one for a log cabin, the other for a "ship-shape house," that will hold a hearty welcome for you on "play-days."

IT MAY be a long, long trail or a short one that leads to your favorite lake, mountain or seaside resort. Whatever the trail and wherever it leads, there's no greater summertime joy than to find at its end a log cabin, summer cottage or simple shack of your own.

"This is the life," you say to yourself as your cabin welcomes you for week ends and play days. In old clothes, you can "unlax" and discard the formalities of city life. Perhaps your cabin, like mine, acts somewhat as a fountain of youth. Memories of it during winter months and enjoyment of it during summer days help keep me on an even keel. It promotes health, happiness, optimism and it's a crude affair of old pine logs up near the Canadian boundary.



Here are floor plans of log cabin shown above. Front, rear and dining porch serve as extra bedrooms.

The two plans I have selected for this issue combine the three essential requirements of a successful cabin: flexibility of service, unusual comforts and reasonable cost. In fact, an ambitious person with the help of a good carpenter can do much of the work himself on either of these houses.

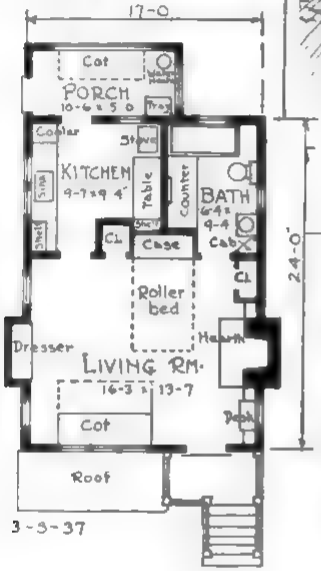
Plan 61-L-C, the log cabin, has only one bedroom. Yet it is planned to accommodate 10 people overnight with slight rearrangement of the living room and by using the

BUILD ONE YOURSELF

HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newly-Weds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.

Designed by old time sailor, this unique "ship-shape" cottage is equipped with space-saving furniture that does double duty.



Left — Floor plans No. 3-S-37, for cottage shown above. Blue prints may be had by mailing $1 to Modern Mechanics Home Building Editor.

front porch for sleeping purposes. Plan 3-S-37, the sea or lake-side cottage, can accommodate at least seven people over night and yet there is not a bedroom in the house. Even so each person is provided with privacy and real comfort. Designed by an old time sailor, it is patterned after the space saving stunts used in fo'c'sles of ships. There's enough trick cabinet work and double duty equipment in the cottage to make any handy man's hands itch to get busy with hammer and saw and build one like it.

Cabin 61-L-C is of logs. Not every one lives in log country, however. Even so, this cabin will look well if finished in half round siding to appear like logs. Plain siding, though, will be satisfactory.

Logs for this cabin are six and seven inch tops calked with oakum. The roof is log rafters with 4½" tops overlaid with surfaced pine boards and then covered with wood or asbestos shingles. Footings are concrete and the base course is cobblestone. Log joists for the floors have 8" tops on which is laid the sub-floor and then felt or fibre insulation and finally a finish floor of pine.

Interior partition walls are pine boards on 2"x4" studs. Casings for doors are half logs. Doors throughout are matched plank of 1¾" pine with half log battens. The fireplace is made of cobblestones and the hearth is flagstone. Floors throughout are pine except the kitchen which may be covered with linoleum. And that's the general story about construction.

What about double duty equipment? A large living room, 23' by 12', opens onto a broad porch which can be used for both living and sleeping service. By running a partition from the fireplace to the front porch you can provide another bedroom. In this case the living room will be lengthwise of the house. Next to the fireplace is a closet for a roller type bed. And in an emergency the dining porch might be used for overnight service. Taken all together you can accommodate 10 people in this cabin with comfort and privacy.

(Continued on page 209)

Bike Geared to Revolving Brush Cleans French Streets

Jaquelin, French bike champ, riding his street cleaner—a three-wheeled bicycle fitted with revolving brush which sweeps cobblestone streets.

A FAMILIAR but somewhat unique vehicle to be seen driving about the street on the outskirts of Paris is a three-wheeled bike equipped with a revolving brush. This unique contrivance serves as the street cleaning department, and is used widely throughout France, particularly in the small towns.

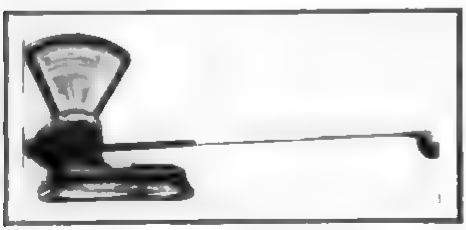
The revolving brush on the rear is geared to the bike wheels, as shown in the photo at the left, and the bike is manned by a French whitewing who inherits the job from his father. Compared with modern street cleaning equipment the conveyance seems rather primitive, but it does the job up thoroughly, nevertheless.

Golf Clubs Matched Automatically

WITH a device known as a golf club classifying auto-gage it is possible for fastidious golfers to select a balanced set of clubs from stock, to select and match a club to any set, to exactly duplicate a club, or to replace a broken club by mail if the weight and balance of the original club are known.

The handle of the shaft is placed in a stop. Ten inches from the end the shaft lies on a rest on a platter. With the club in this position the dial on the device will indicate the pressure exerted at the point where the club is supported on the platter. This pressure is the same as that exerted upon the fore finger of a player's left hand when a club is held in the playing position. The device makes possible the automatic and mechanically perfect matching of golf clubs, and will do away with the old alibi of poorly matched clubs.

The weight of the club is registered on a scale, as demonstrated in the photo below. Manufactured by a well known scale company, the device will prove a boon to fastidious golfers.



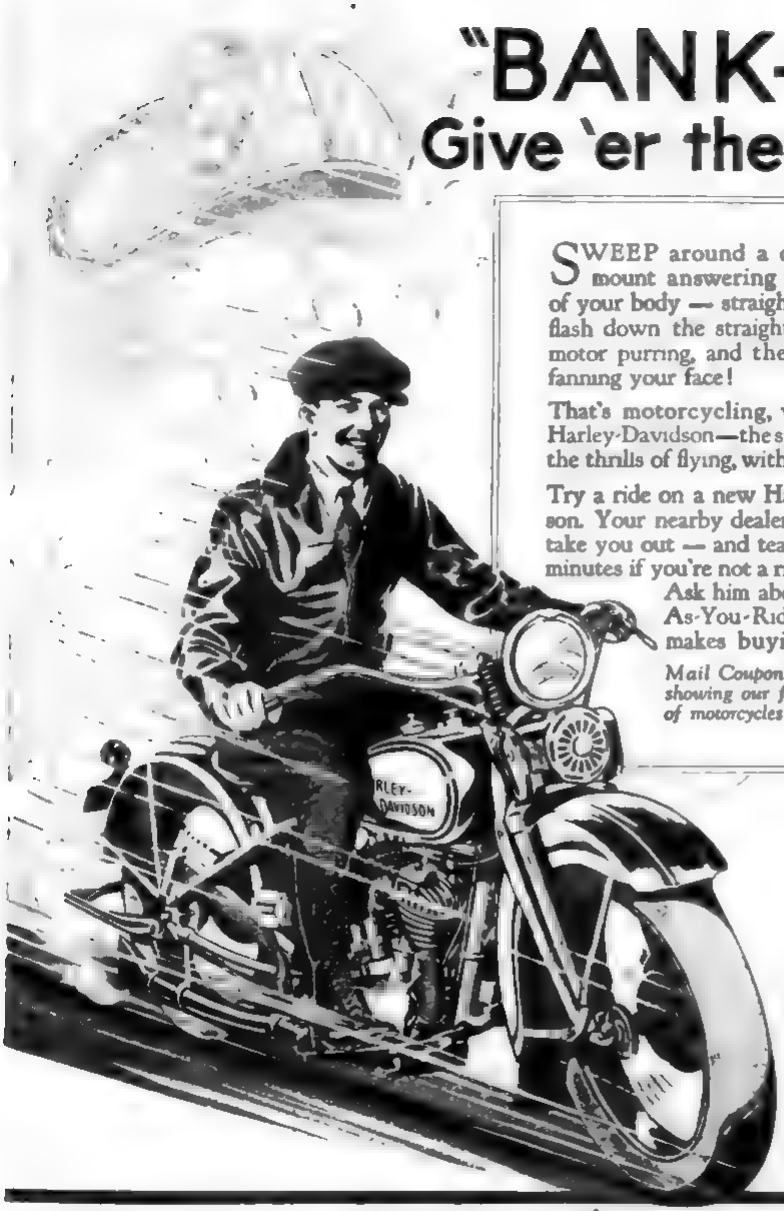
The new golf club auto-gage which permits exact duplication or selection of balanced set of clubs.

Odd Sand Yacht for Beach Thrills

Here is one of the unique land yachts which provide thrills at bathing beaches. It is fitted with four pneumatic tires and a huge lug sail as shown.

ON THE bathing beaches of Belgium there are now to be seen a number of novel craft which scurry along the sands to provide zestful entertainment for vacationists. Sand yachting, the devotees of this new sport call it. The crafts used are a combination of runabout and sailing boat, having four pneumatic tired wheels and a huge lug sail which catches the breezes and drives the boat at a breath-taking speed.

"BANK—and Give 'er the Gun!"



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Make Your Own Firecrackers

(Continued from page 108)

place and with the fuse pointing forward, but one behind the other. Then the first flash cracker explodes, and in so doing, exposes the next to the sparks from the rocket which explodes, and so on. Thus, during the flight of the rocket, rapid and brilliant flashes augment the spectacle.

If you have an "electrical bent" you'll enjoy making the can bomber, which consists of spark coil, a 2 or 3 cell battery, spark plug and switch. Mounted on a base, a heavy tin can with tight-fitting lid becomes the bomber proper. The spark plug is fitted up through the base and when the switch is closed, explodes charges of powder. This blows off the can lid with a loud report—and you're ready to repeat.

Use a pint or quart can and be sure the lid fits tightly. Get a board 1 inch thick, 8 inches wide and 20 inches long and put two 2 by 4 inch pieces under the ends to raise it above the ground. Bore a hole through the board near one end of such a size that the spark plug to be used can be screwed tightly in place from the underside. Make a hole to just fit the top of the plug in the can bottom and set it in place. Describe a circle on a 2 by 8 by 8 inch block the size of the can and cut this disc out with a band saw, making a cut to start from the outside. Then slip it in place and pinch the starting saw cuts together to squeeze the can and hold it in place. Then nail down the block to the 1 by 8 inch base.

Get a spark coil and rig it up as shown with a switch so when this switch is closed, a spark jumps the plug gap.

The bomber can be used in several ways. One method is to get some small grain black powder and make up a batch of small cartridges by putting a small amount of the powder on a square of tissue paper and tying the top shut. This cartridge is pressed down upon the spark plug points, the lid pressed on, and the switch, carried some distance away, closed.

Another method is to merely fill the cup in the plug with powder, bringing the top up and touching one of the points. If this is done, care must be exercised and the plug cooled off after each charge to prevent a possible premature explosion.

Or you can fix a firecracker in the can in such a position that the fuse lies between the

Make Your Own Firecrackers

spark plug points and when the switch is closed, the spark ignites the fuse. This form of Fourth of July fun is both effective and cheap, since 50 cents' worth of powder will last a long time. Use a can large enough to admit your hand easily.

A lot of fun can be had with an easily turned wheel on a suitable support. A bicycle wheel is best and it should be mounted to a post well off the ground. To make a gigantic pin wheel, bind two small sky rockets diametrically opposite, to the rim with wire. Remove the sticks carefully as they are not needed. After seeing that the wheel turns with but little effort, light one of the rockets. Confined to a small orbit, it will roar around the circumference of the 30-inch circle with almost terrifying speed. After a time it stops and you can light the other rocket with a repetition of the performance. By fastening both rockets in place at the same time, even though one at a time is used, the wheel will be balanced properly. Or you may rig up a light tin deflector in such a manner that some of the first rocket's sparks are thrown against the fuse of the other rocket, and presently the wheel will be going in the opposite direction.

In like manner, a number of sparklers can be attached to the rim of a large wheel that turns easily, and another effective spectacle results. Lighting one or two at a time produces a striking effect when the wheel is spun at a good clip.

Now a few don'ts in conclusion.

Don't take undue risks.

Don't let youngsters meddle when not wise.

Don't let spectators stand too close.

Don't violate city ordinances regarding fireworks. If your city prohibits certain July Fourth demonstrations, arrange your party out of town.

Interested in building boats?
Turn to page 198.

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Pietenpol-Ford Motor Conversion

(Continued from page 157)

The dimensions for the exhaust stacks are shown in the drawing. They are made of 20 gauge tube and have tabs welded on them to keep them in place under the hold-down bolts.

Dimensions for the hub plates of 12 gauge cold rolled steel are shown in full.

The oil intake pipe on the base will have to have a slight bend made in it to allow the water pipe to pass.

The radiator is a half section of a war surplus MF flying boat radiator. I can supply you with these if you cannot get them from any local supply house.

There is also being run with this article the full size cross sectional view of the Ford motor as it is used in an automobile. The parts used in the car are left in the drawing, with the exception of the magneto mounting, and the prop is shown in phantom drawing to prove to you how very little needs to be done to the Ford motor to make it an airplane engine. By comparing this drawing with the other two full page illustrations, you will be able to see what little difference there is between this engine and the so called converted one, which really is not converted at all—just "adapted".

I also append the power chart for the motor, which will show you airplane design fans what you can expect from the motor if you use it as I have here. If you want to design your own ship this curve will show you what power you can expect and what the revs will have to be. Note that at 1,600 revs there is plenty of "soup" left in the old gal yet. And there will have been very little falling off in torque at these r.p.m.'s. That is why I chose 1,600 as being the best revs to run the motor at.

In use, treat the engine like you would any other airplane engine. Don't take off with a cold motor, and watch your mixture and your motor temperatures very closely. A remote temperature gauge should be used and the motor ought to be run between 140 and 160 degrees Fahrenheit.

And that just about covers all that need be said about the Pietenpol Motor Conversion, simple as it is.

You'll find the engine simple and dependable—one easy to repair, and capable of carrying you and your crate thousands of miles.

Win a Prize With Your Baby Auto

(Continued from page 173)

mechanical parts needed are a jackshaft from which a chain can be run from the motor sprocket so that a double chain can be run to the rear drive wheels.

Because of the narrow tread of a small car the use of a differential is questionable. One can be nicely made from the rear end of any vacant lot lizzie, though.

The use of the motor mounted so that air drive is affected has good possibilities, though in windy countries the speed into the wind is retarded by exactly the speed the wind is blowing, and no advantage in the opposite direction is appreciably gained when the wind is blowing the same direction the car is traveling. At what would be enough motor speed and propeller activity to move the bus 25 miles an hour on a still day, the car could only make 5 miles an hour in the face of a 20 mile an hour wind. You see the prop has to "eat wind." Going the other way, the disc area of the whirling prop is not large enough to act as a sail to any extent, and the increased thrust is negligible.

Bodies and axles are all left for consideration in briefly outlining what may be done in simplified designing.

Take axles, for instance. If you use the cast or wooden type of wheel, with drive from a jackshaft transverse to the frame at a point about under the passenger seat, all that will be needed is a solid steel tube axle. It would be possible to make the rear wheels independently sprung by splitting this axle and running the chain direct to only one wheel. What extra wear might be encountered in a one-wheel traction system might be saved in the cost of parts for a two-wheel system. Independent springing of each wheel is the coming thing in automotives, as each wheel takes care of its own bumps and shocks.

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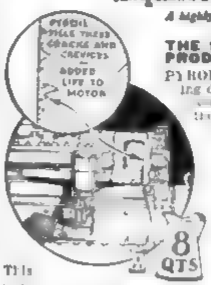

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Diving to Solve Polar Mysteries

(Continued from page 82)

by means of a submarine trade route. Hudson Bay is a natural sea outlet for the great wheat-raising country of western Canada. If the *Nautilus* demonstrates its ability to fend off and dodge icebergs in the region of Greenland, the submarine may come into its own as a wheat cargo carrier. For, as a glance at the map reproduced elsewhere in this article will show, a northern submarine route between Hudson Bay and Liverpool, a world wheat market, is the most direct and shortest that can exist. Furthermore, a submarine can carry a respectable cargo tonnage which may some day make it a competitor of steamers in certain cases.

The "polar front" theory of weather prediction, which may be studied by the Wilkins expedition through the use of sounding balloons and instruments for measuring air densities, has as its basis the following facts: The mass of air in the northern hemisphere is 10,000,000,000 tons greater in January than in the following July. This means that this vast tonnage of air is shifted once a year, developing terrific energy. The horsepower developed by winds has been calculated at 20,000,000,000. Some day this vast source of latent power may be tapped.

Even the force of gravity, always a mystery, but today more mysterious than ever with Prof. Albert Einstein challenging the principles established by the great Newton, will be investigated by the expedition. It is known that the force of gravity varies in different locations on the earth. Instruments carried on the *Nautilus* will enable scientific members of the crew to take records that may have an important bearing on the mystery of gravitation.

Some one has suggested to Sir Hubert Wilkins that his submarine will be gold-plated when it comes home from the Arctic. It is supposed that the Arctic ocean has a heavy gold content, and that it will be deposited on the metallic sub, attracted by the electric batteries which propel the ship—a sort of huge electroplating scheme devised by nature. There is little likelihood that this much to be desired event will come to pass, but there is a certain amount of justification for the prediction. Not only Arctic seas, but all sea water, contains minute quantities of

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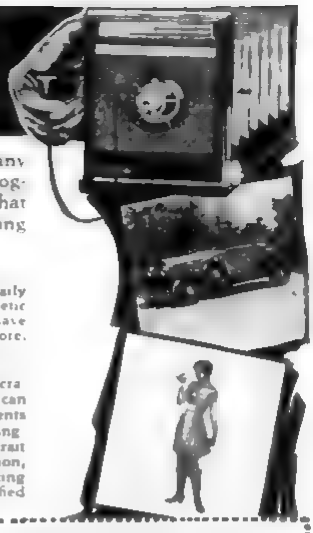

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Diving to Solve Polar Mysteries

gold in suspension. Science has long known this, but no satisfactory means of extracting the metal cheaply has yet been devised. Submarines traveling through temperate waters have shown no tendency to collect gold-plate on their hulls.

It will be seen from the foregoing that it would be a brave man indeed who would describe the Wilkins expedition as a mere adventure. It is an adventure, of course—so was the journey of Columbus to the new world—but it is a project which may prove of inestimable value to the world at large.

There is always the possibility that these daring men may not come back. The *Nautilus* may be crushed in grinding ice, may become hopelessly wedged in the bottom of an iceberg. No one denies the dismaying odds of peril and sudden death which confront the expedition.

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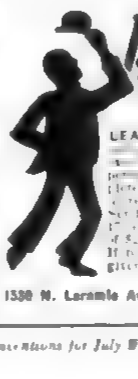

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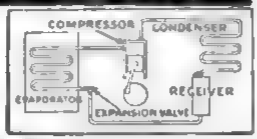

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Demonstrate Air Attack Strategy

(Continued from page 50)

such as the Ford or Fokker.

The basic flying unit for all types of planes is the three plane flight called the element. The three planes of the element fly as a single unit, the rear planes slightly above and on either side of the leader. The element leader signals to the members of his element by dipping his wings or pitching up and down. Three or more elements are combined into a unit called a Flight. Two flights usually compose a squadron.

Pursuit planes operate in groups of one hundred from three to five miles high in the sky. They must be high up because the plane on top can dive to attack the one below, and therefore the odds favor the pilot with the most altitude. The drawing depicting the attack on New York City, accompanying this article, illustrates how the pursuit planes are arranged. The lowest squadron of 25 planes called the assault might be at 17,000 feet; the next—called the support—would be 19,000 feet high. Two thousand feet behind the last two squadrons, with their 50 planes, called the reserve, would be at 21,000 feet. These altitudes are variable depending on the ceiling of the plane and the weather, but the ships are always stepped up and back in this manner.

An attack on enemy airplanes below would be started by the assault squadron. It would split up into its three plane elements and each element would dive on one of the enemy ships in the formation below. Element follows element so closely that the unhappy victims have no time to recover from one before the other is on them. The support squadron follows the assault down in the same manner and lastly if necessary the reserve dives down, three-plane element following three-plane element. While the upper squadrons are attacking the ones who dove first reform and climb for another attack.

When a pursuit group meets another pursuit group and both are willing to stay and fight, the battle becomes a dog fight. Pursuit planes have only forward guns aimed by pointing the planes and each pilot tries to get on the tail of the enemy and stay there. The pilot with the most maneuverable plane then has the advantage. If he can turn a shorter circle he can stay behind and inside firing on his scuttling enemy while safe himself. A dog fight is each for himself but when one man has downed his enemy, he joins one

Demonstrate Air Attack Strategy

of his partners and helps him dispose of his opponent.

Bombers do not fight in the air unless they have to, and then only defensively against air attack. For this reason the bombing formations are different than pursuit. The pursuit is stepped up and back to facilitate the dive of one element after another. The bombers have to meet this dive and so they are stepped back and down. In this formation they can bring the four guns of each bomber of the formation to bear on the attacking pursuit. A bombardment group of 52 planes has 208 machine guns which can fire 240,000 rounds a minute on the attackers, a veritable hail of steel.

These formations are pretty tough for the pursuit to break up and their effort is to attack first one and then another bomber, no two following attacks being directed at the same plane, and to so disperse the machine gun fire of the bombers that it will not all be concentrated at a single diving element. The pursuit element comes down on the bombers as it spreads out and the three planes of the element dive at one bomber from three different directions.

It is easy to talk of formation flying and it is easy to see how much more effective are great numbers operating together than single planes, but this massing of units that are floating on billowing air currents is difficult and dangerous. Flying in formation is hard and skilled work. Planes are tossed up and down and sidewise and would crash into each other except for the constant watchfulness of the pilot, who must sense each movement of the air and fly against it before he is thrown into his neighbor. Many bad crashes have occurred in formation flying when planes have locked wings.

It may be assumed, from the description of attack aviation given some paragraphs back, that the airplane has everything its own way when attacking ground troops. This is far from being the case. The infantry has been developing effective defenses against air attack. Anti-aircraft artillery is becoming increasingly effective. It is, however, impracticable to attack artillery units to every marching element, and defense must therefore be made with the weapons with which the infantryman is provided. These include the rifle, machine gun, trench mortar, and one-pounder gun.

(Continued on page 204)

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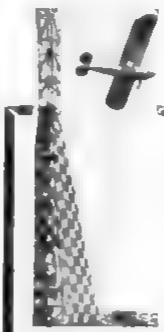

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Filming Foreign Movies

(Continued from page 134)

British Foreign office. This was correctly reproduced, even to cobblestones on the street, from photos and drawings. When George Arliss played "Disraeli," the English garden scenes were filmed at the famous Busch garden at Pasadena. Night jungle scenes for another picture were "shot" on a Los Angeles estate. And when the snow melted away from a Russian mountain scene, the company returned to Hollywood and completed the close-ups, using gypsum for ice and a painted curtain to represent the snow-laden trees in the background.

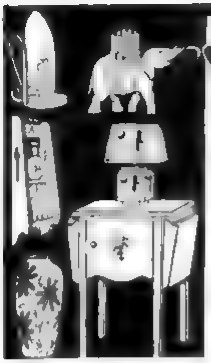
One script called for scenes to be laid on islands bordering the South Seas. "Prop" palms were planted in a cove on Catalina island, carpenters built high prows and repainted several canoes, and 200 Hollywood extras, blacked with grease paint, took spears in their hands and became man-eating warriors. Yet you would not have known, in viewing the picture, that the scene was nearly 100 percent "movie made".

South Seas in California

For another picture an actor was shown on the floor of the ocean near a South Seas island. In fact, he did descend to the ocean's bottom and was filmed with a special camera. But the waving sea grasses were "planted" there to resemble the floor several thousand miles further south.

On another occasion a technical expert spent several months in England collecting data for the reproduction of scenes in London's Mayfair, and particularly for a sequence showing an Oxford-Cambridge boat race. During this time a director flew daily in a fast airplane over southern California seeking locations. Finally the boat race was pictured near San Pedro.

While it costs only one-twentieth as much to film a foreign scene in sunny California as it would to transport a company of possibly 2,000 to the country depicted, sometimes the physical difficulties try the mettle of actors and technicians. No African desert could burn any hotter than the Imperial Valley. In fact, it sometimes becomes necessary to lighten the complexion of actors after the Imperial sun has baked them two weeks. And summer storms and winter snows sometimes chase them back to Hollywood or freeze them in, in some mountain "Russia" or "Siberia".



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Bows and Arrows for Archers

(Continued from page 167)

Complete the bowstring by waxing together the three strands between the laid up ends, rubbing them with a cloth to melt the wax and unite the strands. Twist the strands slightly as you rub. Whip the bowstring at its center, for a distance of 8 inches, with No. 50 linen thread. Wax the whipping, and rub the wax briskly.

Finish the wood in this way. Apply two or three coats of lacquer or varnish, and after each coat has dried, rub down the surfaces with a piece of cheesecloth dipped in shellac. Rub with and across the grain. Trim the bow ends with aluminum paint or black lacquer, and glue a piece of velvet, with edges turned under, around the handle.

In making the arrows, use maple or birch dowel sticks 5/16 inch in diameter as shown in diagram 1. They must be absolutely straight, and free from defects. Your shafts should be between 25 inches and 28 inches.

Notch one end of the shaft to a depth of ¼ inch, for the nock. Cut with a coping-saw, and smooth with a flat file and sandpaper. Slip a cartridge shell over the shaft end, and fasten it by denting the side with the point of a nail.

An arrow head that will penetrate better when shot at a straw target is shown in diagram 3. Feather the shaft with turkey feathers procured from a sporting goods house. Lay them flat upon a board and cut them with a safety razor blade. Split off half of the quill and coat the remainder with ambroid cement or glue, and mount on the shaft as shown in diagrams 5 and 6. Lacquer your arrow shafts, in color, and rub down to a fine finish with a cloth dipped in shellac.

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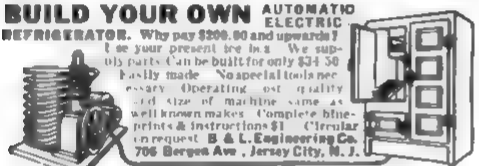

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Amazing New Uses for Sound

(Continued from page 98)

chanical affair, the shape of the coiled spring actually delaying the movement of the waves.

But down in lower New York every message passing through on the radio-telephone circuits is delayed for a couple of hundredths of a second by electrical means. The trans-Atlantic wireless-telephone service can work in only one direction at a time, because the sending and receiving stations are tuned to the same wave-length. A voice current going to Europe is picked up also by the American receiver, and unless the wire line between receiver and transmitter is blocked, the signal would "loop the loop", causing the circuit to howl. If you are talking from New York to London you control the circuit so long as your voice continues. When you stop, relays must work to reverse the channel, so the person at the other end can answer. Your voice, as electrical impulses, travels with the speed of light, while the relays, being mechanical, must have a fraction of a second to work. That's where the speech-delay apparatus comes in. The man in London may start talking instantly, but the apparatus will store up his voice in London for an instant while the relays are doing their work.

While primarily concerned with the development of the telephone, we are constantly contributing to many other fields. One of the most recent developments was the eliminating of the last disturbing sound from talking picture films. In the early days of sound recording on movie film there were many outside noises. Eventually they were eliminated one by one, until finally only a swishing sound remained. By changing the mechanism of the light valve at the recording end it is now possible to eliminate this last noise, and a remarkable change in talking pictures was the result.

Research in the recording of talking picture sounds on wax discs also has resulted in a marked improvement in reproduction. We have gone back to Edison's original method, as used on the old-time cylinder records. He utilized what is known as "hill and dale" recording, the cutting stylus engraving a line of varying depth, instead of the waving, side to side method which Berliner developed with the first disc records. The hill and dale method was not a success

because of the limitations of the acoustical method of recording.

In following the wavy line on present day records, the reproducing needle is thrown back and forth from side to side of the groove, and does not follow accurately the path traced by the cutting stylus. By reverting to the hill and dale method, and using a permanent needle in the form of a sapphire point, our engineers have attained practically perfect reproduction.

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Besides contributing to such widely separate fields as better hearing and the talking pictures, our staff also is assisting in the research designed to isolate the cause of cancer, and in other biological fields. This is an offshoot of our investigation into the crystalline structure of metals and alloys, a subject of great importance in the manufacture of telephone apparatus. Francis F. Lucas, with his photo-micrographic equipment which utilizes ultra-violet light and magnifies as much as 5,000 diameters, has been able to explain many obscure things about why metals harden under heat treatment, and why they crack in service.

Applying his technique in the field of biology, he has been able to take pictures of living cells without the use of stains, which might damage or change their structure. He is able to take photographs of successive layers right through the cell, at intervals of one one-hundred thousandth of an inch. In other words, if the cell is one-thousandth of an inch thick he can get one hundred photographs showing its structure at as many layers. Pictures taken of the surface of brain tissue have shown such startling things that plans are being considered for improved apparatus by which a "map" of a section of brain may be made, just as aerial photographic maps are made by assembling large numbers of photographs taken at appropriate intervals. If the full power of Dr. Lucas' equipment were utilized, a map of a section of brain only one-fourth of an inch square could be made with an enlargement

(Continued on page 199)

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Amazing New Uses for Sound

(Continued from page 197)

to more than 104 feet square. Of course, a larger area would first be photographed in smaller detail, and then special sections selected for further magnification and study.

There is no apparent connection between our work and study of cells, but the photomicrographic equipment has already contributed toward one of the major improvements in telephonic communication, an improvement which is saving at least $10,000,000 worth of lead per year in making telephone cables. Lead hardened with antimony has been been used for cable sheaths, but they had an annoying habit of breaking down after a few years of use. Dr. Lucas discovered by micro-photographs that the antimony after a certain period disassociated itself from the lead. As a result of that discovery a new mixture was found, one so much stronger that a thinner, lighter lead covering could be used, and the result was an enormous saving in lead. His studies of all the metals and alloys which go into telephone equipment manufacture also have contributed to general improvements in many lines.

Another field to which the telephone industry has contributed, is the improvement of radio broacasting. Crystals to control the frequency of a broadcasting station and keep it on its exact wave length have been developed, and so successfully that two stations in Iowa, under the same management, are broadcasting all the time on the same wave length, instead of giving only half time service as would be necessary if they shared the wave.

Dirt Track Racing

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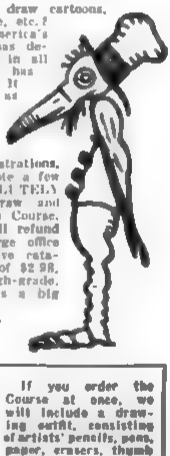

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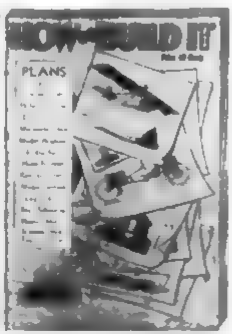

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Build "Punkin Seed," a Fast Racer

(Continued from page 126)

running seam battens through the frames. This makes a much heavier boat, and a slower one naturally.

With the sides and bottom on the boat there remains the trimming off of the bottom plywood before the hull proper is completed. This can be done with a fine toothed saw. A plane will put a nice edge to it. Then the edges of the plywood can be doped with the Jeffery's glue. Put it on hot! Then it will soak in and be fine.

Now the cross pieces on the tops of the frames can be taken off and the whole boat turned right side up, having been removed from the backbone on the sawhorses.

The next thing to put in is the ½"x6" oak transom backing. This is let down into the side planking at the sides, and is fastened there with long 2" screws and galvanized finishing nails. We say use finishing nails in this point because the screws, unless carefully driven, will be apt to split the side planking. Of course it goes without saying that all screw holes have to be drilled the root size of the screw or you will not be able to sink a screw without splitting something.

Both the mahogany side planking and the oak backing piece will hold fastenings well, so a few galvanized finishing nails can be used.

You see the function of this backing piece is to furnish a pulling partner for the transom. The pull on the top of the transom is backwards. Dotted lines on the inboard profile drawing show how the tension of the transom is transmitted to the backing piece by brass hooks, bolted to the transom.

These bolts should be four in number. Two of them run through the transom five to seven inches off center. The others are each twenty inches off center. This will be strong enough to keep the transom in the boat on the turns.

After the hook backing is placed in the hull, the deck beams are put in. Before the beams in the way of the cockpit are put in, you will have to scribe off marks where the stanchions (shown in the cross sectional drawing) run up from the bottom frames. These will have to be put in and securely fastened with screws. Then the beams in the way of the cockpit are put in.

You will note that all these beams are

Build "Punkin Seed," A Fast Racer

sawn from ½"x2" spruce, and are crowned, or cambered to an arc equal to 6" in the beam of the boat. The proper way to arrive at the right curve is to set off a chord of 44 inches, the beam of the boat, and then strike a circle which will have 6 inches crown. This beam is used as a pattern for all the frames.

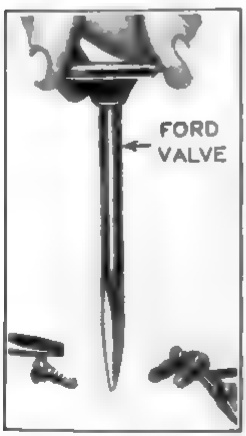
There is, forward of frame No. 6 and aft of frame No. 5, a thick 2 inch piece of spruce which is used as a hook to anchor the coaming where it is cut into the forward ends. Ordinary screws fasten this piece in, as well as the ¼"x4" coaming, which is made of oak or mahogany. This is put in next and is not difficult in the least.

The deck up to station five and a little forward of it is made of 3/32" haskelite plywood with a mahogany face. This is fastened with ⅜" brass screws of very fine wire.

The forward deck is built up like the turtle back of an airplane. Grade "A" muslin is tacked down around the edge of the deck, and three coats of airplane dope applied, each after the preceding dope has dried.

Next the half round around the deck edge is screwed home. Then the boat is varnished. Three coats of the best spar varnish will do the trick, and the boat is ready for launching.

Screw Starter From Ford Valve



To make the punch, grind or file down old Ford valve to long tapering point as shown in photo.

A PARTICULARLY handy tool for starting screws in hard or tough wood may easily be made by anyone at the home workbench from a discarded Ford engine valve. It is merely necessary to grind or file the stem of the valve into a long, tapering square ending in a sharp point. The valve seat makes a handle more convenient than any kind of a wooden ferruled affair.

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Camping for Health and Recreation

(Continued from page 91)

should be eaten by the camper in preference to a heavy meat diet. Caution should be taken in buying canned meats and fish at a small, country store. It may have been in stock for a long time. Always reject any can that shows the slightest bulging. A camper can't afford to flirt with ptomaine poisoning. Freshly caught fish, particularly if boiled or baked, can be partaken to one's heart's—or, rather—one's stomach's content.

Sanitation is essential to health. All waste matter should be buried. A short-handled shovel should be part of every camper's equipment. Even dish water and wash water should not be hurled broadcast over the ground. It should be poured in a hole and be covered over. Food particles in the dish water are particularly attractive to flies, and any moisture attracts mosquitoes. A good toxic insect solution is valuable when camping. In lieu of it, gasoline sprinkled over any damp spots will lessen the fly and mosquito nuisance.

Always keep the tent well ventilated, but protect all openings with mosquito netting. Do not sleep in a closely sealed tent. There is no need to fear any prowling animal in North America. A mountain lion or a bobcat—if it gathered sufficient courage to approach one's tent—would scamper away at the first move of a human being. A grizzly bear can scent humans miles away and will keep that many miles away. Black and brown bears are absolutely harmless—they can be shooed away from one's tent with the shake of a newspaper.

The most dangerous animal life that a camper may encounter is a small tick found in the northern Rocky Mountain states. This is reputed to be the carrier of Rocky Mountain fever, a serious and sometimes fatal malady. Thorough shaking of the blankets before "turning in", will eliminate this menace.

To get the most in health and recreation from a motorcamping trip, a few fixed rules should be followed. Here are a few of them:

Use water for cooking and drinking only from a certified source. If in doubt, boil the water first.

If one plans to "hit the road" early in the morning, pitch the tent so that it will get the rising sun. Avoid, when possible, rolling up a damp tent or blankets.

Camping for Health and Recreation

Use a tent with a sewed-in floor—and keep the floor clean. Always shake the blankets before fetching them into the tent.

Do not carry cotton or straw filled mattresses on an inter-state camping trip. The quarantine office of many western states will not permit their entry. Kapoc mattresses—in a clean condition—are not barred.

Do not use "ethyl" gasoline in a campstove or lantern. The fact is: it can't be used. Don't experiment and invite trouble.

Do not burn a campstove in a tent for warmth. Use more blankets. The residue gases from the campstove are not healthful.

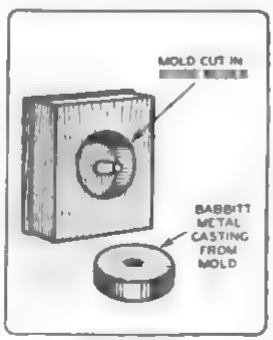
Always ask permission before camping on private grounds. It may save you from getting acquainted with the sheriff.

Don't think you're giving the family pooch the time of his life by taking him along. In auto camps and in the National Parks, he must be leashed all the time. Under no condition, take the family cat. Felines are strictly barred in all the National Parks.

Famous last words of one motorcamper (deceased): "I often hit eighty with my bus."

Casting Toy Engine Parts

WHEN making small engines or similar toys it is often difficult to procure a ready made eccentric, collar, or pulley in just the shape you want. It is easier to make such items for yourself rather than attempt to alter ready made parts or get along with some other makeshift. Babbitt metal, which is hard and tough and has a low melting point, can be used to make your castings. Make your mold in wood instead of making a pattern, and face the bottom of the mold with cigar box wood. Heat the metal to a temperature where it will not char a match put into it while melted. The mold can be used over and over again.



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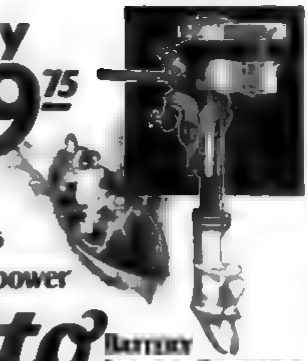

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Demonstrate Air Attack Strategy

(Continued from page 193)

An airplane is vulnerable to small arms bullets. During the World War there were not only numerous instances where airplane motors were put out of commission by machine gun bullets, but it was found that the greatest single factor in the destruction of planes in the air had been ignition of gasoline leaking from bullet-punctured tanks. Furthermore, bombs carried by attacking planes can be exploded by the impact of rifle bullets, destroying their carrier.

The problem of the infantry was to devise some system of anti-aircraft firing that would lead to the maximum number of effective hits.

First it involved firing at a 30-foot ship traveling from 90 to 120 miles an hour. The angle of the plane's approach might be either parallel, oblique or vertical. The range would change swiftly from 1,500 yards to 50 feet.

Early tests were not encouraging. Shots resulted mostly in misses. It was obvious that a rifle aimed at a target traveling 100 miles an hour would not register a hit despite the fact that a bullet travels 2,760 feet a second.

The solution was offered by an old duck-hunting soldier.

"Don't try to hit the bird. Let the bird fly into your shots," he advised.

The experts tried it and found that the same factors that are recognized in shooting moving game applied to anti-aircraft firing with a rifle and machine gun. The principle of "leading through the target," that is directing the aim first at the ship and then carrying it to a point in front where it will intersect the path of flight, was made the basis of training.

"Tank planes"—so-called because of their all-metal construction—are being developed for the Army, carrying a quarter ton of bombs and a half dozen machine guns, making them quite the deadliest weapons of their type ever perfected. Secrecy surrounds the construction of these planes, one of which is being built by Fokker and the other by Curtiss for experimental tests, but it has been reliably learned that both planes are all-metal, low-wing monoplanes, powered with Curtiss Conqueror engines which will give a speed of around 200 miles an hour.

The Fokker flying arsenal has two cockpits in its fuselage. One is for the pilot and the other for the observer posted behind him. The observer will operate the guns in the

wings and drop the ten 50-pound bombs at strategic points. He will also have to defend his plane from the attack of enemy airmen.

In order that the observer might fight off the attack of enemy planes, two guns have been installed on a scarf ring or gun carriage, making it possible for him to fire at any angle.

It has a wing span of 65 feet. The metal fuselage is oval in shape and tapers off toward the rear like the body of a wasp. It required one year to build her.

A similar attack plane was being built by the Curtiss engineers at their Buffalo factory. There were some slight variations of design, however. The machine guns were hidden in the undercarriage instead of the wing. The reason for this is ascribed to the fact that Curtiss mechanics are believers in the superefficiency of the thin-wing while the Fokker people sponsor the thicker one.

On the other hand, the Curtiss design requires a supporting strut while the Fokker machine needs no external bracing, since it has a full cantilever wing. On the Curtiss battle plane there is a tunnel gun installed in the bottom of the tail on a swivel so that it can be used in raking fire in the rear and underneath in case a hostile plane should attack from those quarters and out of the observer's range of vision.

Since it has been arranged to have special contacts by electricity, all of the guns on these new American terrors of the skies can be fired simultaneously. The Fokker warplane can spread its shower of 3,000 pellets a minute even when it is in a power-dive and going at six miles a minute.

This is an improvement on the old type of military aircraft. On the old models the guns were timed with the engines and fired through the propeller disk, only at a speed in proportion to the revolutions of the engine. As for wing spread, the Fokker and Curtiss designs are alike. The Curtiss fighting plane will also carry 500 pounds of bombs on racks under the wing.

General Foulois is commander-in-chief of the First Air Division. Col. H. H. Arnold, whom MODERN MECHANICS AND INVENTIONS readers will recognize as editor of Plane Talk department, is in charge of the supply department of the vast air armada.

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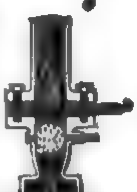

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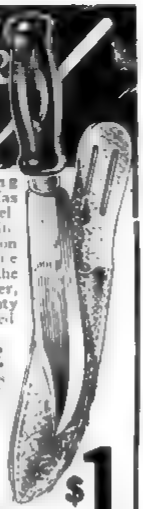

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(Continued from page 74)

gold dust wouldn't begin to fill the eraser socket of an ordinary lead pencil. A location that will yield 25c worth of gold for an hour's work means $2.50 for a ten hour day, and with living expenses reduced to about $5 a week, is far better than being out of a job and stony broke in a city.

By moving about a bit, however, and finding the highest grade of gold-bearing sands one's earnings may be vastly increased. A lot of gold panners in California streams are earning as high as $8 and $9 for an eight-hour day—and they're out in the sunshine and air leading a life that many would regard as a vacation. Moreover, nuggets of gold are by no means a thing of the past in gold-bearing streams. Nuggets have been found worth all the way from 10c up to hundreds of dollars, and it may be any gold panner's good fortune to shake out a nugget.

In Central California near where the original gold strike was made in 1849, a lot of jobless gold panners are working the moss in the bottom of the streams, and are making the equivalent of good wages. Someone discovered that the moss has virtually converted the streams into placer sluice boxes. So, these fellows are harvesting the moss, shaking the goldbearing sand out of it, and panning the sand. In various other parts of the west where gold bearing sands occur in running water amateur prospectors have set up home-made sluices, hoppers, and small scale placer operations. By developing such low cost methods for extracting the gold from larger quantities of sand than could be handled in a gold pan they have increased their earnings until they can now thumb their noses at the wolf of unemployment.

Quite a bit of amateur placer mining is being profitably done by men who have been able to procure some lengths of old pipe. Mountain streams are usually short and swift, and by placing a pipe in the stream at a higher level they develop a head of water for placering gold-bearing sands into their sluice boxes. A number of others have obtained financial rewards for their ingenuity by rigging up old automobile engines and centrifugal pumps with which they are operating what are virtually inexpensive, small scale gold dredging operations.

Several years ago the Saint Francis Dam,

Earn Good Wages Panning Gold

in San Francisquito Canyon, a part of the 286-mile, Los Angeles Aqueduct System, collapsed. A flood of water tore through the Santa Clara Valley to the sea scattering death and destruction before it. It was one of the major tragedies of the past decade, but a tragedy that has since been a blessing to many jobless men. The flood gouged out the canyon walls and brought down vast quantities of free gold, or "float", that is now providing work and the equivalent of wages for hundreds of jobless men. Many of these men were destitute. Now they have a source of income that will last as long as they need it, or until such time as returning prosperity gives them work with wages.

San Francisquito Canyon, however, is by no means the only location where free gold occurs in quantity sufficient to be of interest to jobless men. There are literally thousands of other locations where men who are willing to work can earn from 25 to 50 cents an hour for every hour spent shaking the gold pan. As a result, much of the west, and particularly the states of California, Arizona, Utah, Colorado, Idaho, and Nevada, are experiencing something of a gold rush. The maps reproduced with this article show you the areas in which the prospector is reasonably sure to find gold.

The identification of gold as it occurs in various forms of gold-bearing ore is something that cannot be summed up in a few paragraphs, unless the ore is sufficiently rich to permit the flaking out of actual metal samples. Detailed descriptions of this subject, however, are obtainable in numerous mineralogical books available in every public library. Moreover, the amateur prospector, or the jobless man who takes up gold panning as a source of livelihood during times when wages are lacking, is probably more interested in finding gold to be panned and converted into cash.

Why is it that prospecting, and practically every phase of mining for precious metal, has been at a low ebb for more than a decade? Gold, being the monetary standard of the nation, retains a fixed value. During the World war, and for some years after the war, the country was prosperous. Jobs were plentiful and wages were high. The value of gold remained the same while the price

(Continued on page 208)

NEW ELECTRIC ROBOT CELL
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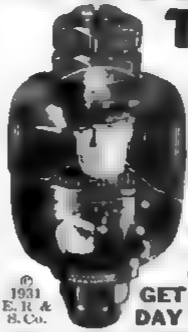

This new all metal Electric Robot Cell, called the DETEC-TO-CELL, stands constant and faithful guard over parked cars Day and Night. No thief can touch your car or anything IN or ON it without starting a Clamorous Riot of Noise that will not stop until he runs away. Protects every part from spare tire and gas tank to bumper and headlights. Do not confuse with anything else you have ever seen or heard of. The DETEC-TO-CELL is entirely new, different and scientifically correct. As great and ingenious an invention as the Photo-Electric Cell. Starting and instantaneous in effect. Positive and automatic in operation. Contains no springs, weights or sliding contacts—cannot get out of order. Installed in ten minutes.

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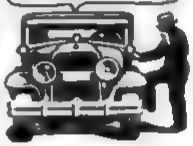

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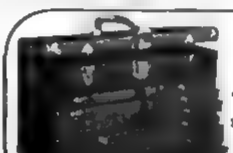

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ON SALE JUNE 10

Earn Good Wages Panning Gold

(Continued from page 207)

of labor, machinery, transportation, and everything entering into the cost of bringing gold out of the ground rose to unprecedented levels. Only the richest gold mines could be operated at a profit. Most mines shut down, and there was little or no incentive for prospectors to seek new discoveries of minerals incapable of profitable development.

Most of us, however, are well aware that this condition changed abruptly immediately following the stock market crash of November, 1929. We've since had idle factories, business depression, falling prices, and jobless men. Gold still remains the monetary standard with the price fixed by the United States mints at $20 an ounce. Mines operating with low grade ore have recently found it possible to resume operations, and during the past few months there has been a revival in mineral prospecting such as the nation has not witnessed for more than a decade. There can be no over-production of gold as long as Uncle Sam continues its free coinage for anyone who delivers it to the mints.

Prospecting has long been a poor man's game, as well as one from which many a poor prospector has become rich. Any man, young or old, who is not actually physically incapacitated, and who is really in earnest about it, can usually find someone of financial means who will help him to a grubstake and outfit. The usual arrangement is that the prospector who operates on a stake goes fifty-fifty with his financial backer on any mineral claims discovered. The prospector or gold panner who goes out upon his own resources doesn't need much capital. A camping outfit, a few simple tools, and groceries sufficient for the length of time one expects to spend in the mineralized regions, are about all that's needed. Transportation, of course, is essential. Many good gold-panning streams can be reached with a cheap, second-hand automobile; but serious prospecting, with the possibilities for making a worth-while strike are largely a matter of travel afoot or with pack animals. Burros are by far the best animals for this work, and a pair of burros can be picked up almost anywhere in the west for five or ten dollars. They can go for two or three days without water, and can usually find enough to eat in country where a horse or a camel would starve to death.

Cabin Days Are Here Again

(Continued from page 183)

A well planned kitchen and bath room with recessed tub completes the equipment. There is no basement but a small cellar can be dug to house a small warm air heater.

This plan, even though shown in log cabin style is well adapted to suburban or urban use. It can be finished in siding, stucco or shingles. And with the porch glazed for year 'round service you'll have as compact yet flexible and roomy a house as you will find in long search. The cost? Well, that depends. As a summer cottage done in siding with partial excavation for heater, this house has been built for as low as $2,500. And the owner used it for all year service. In logs it is difficult to say. Under normal conditions the cost should be reasonable, provided you are willing to do some work yourself.

Plan No. 3-S-37, is as I have said, patterned after the space saving stunts of a ship's fo'c'sle. There's a double bed that pulls out into the room like a drawer from beneath the china cabinet. Space above it in the kitchen and bath room is used for work table and counter and storage. The bed is entirely enclosed when not in use. By means of a ship's ladder and hatchway you reach the second floor where added sleeping or storage space is available. A double cot folds up like a seaman's chest beneath the triple window. On the outside wall is a built-in wardrobe. The fireplace is flanked by bookcases. Finally, there's a Pullman cot on the rear porch that takes care of still another person overnight.

This cabin shows a thatch roof. A plain pitch roof will be satisfactory. The house is frame construction with stucco exterior. Siding will be okey. Space beneath the house may be used for boat or car storage.

Tricky as this plan appears it is none the less practical and offers enough original features to make it a summer home of originality wherever it is built.

Why not build yourself a cabin this summer? Build it near enough to town to be convenient to work yet far enough out to avoid paying high city taxes. Make it a cabin with year 'round service. Many are doing so.

Now that good roads and high speed cars make the woods and lakes accessible in just a few hours from so many of the big cities, cabins and cottages are being used by many people for longer periods each season.

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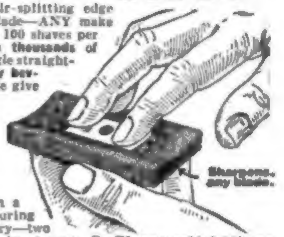
The Master-Hone puts a hair-splitting edge on the dullest safety razor blade—ANY make—in 5 seconds. Many average 100 shaves per blade. **Honing** gives barbers **thousands** of smooth, clean shaves from a single straight-edge blade. This **scientifically bevel** hone makes each 10c blade give $1 to $3 worth of service. MONEY REFUNDED if not THOROUGHLY satisfied.



$30 a day

Agents net as high as $30 in a single day. Mr. Nor sold 40 during noon hour at a Milwaukee factory—two weeks later 50 more men bought at noon. R. Blossom sold 1,000 one week from Detroit store window. $80 to $135 a week is common profit selling friends and others. Earn $25 to $60 a week in spare time. The Master-Hone SELLS ITSELF. Men buy on sight—**no salesmanship required.** Their friends come to you. 100% PROFIT AND BETTER when sold for only 50c.

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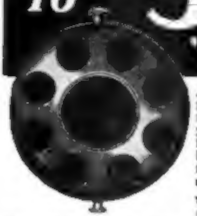

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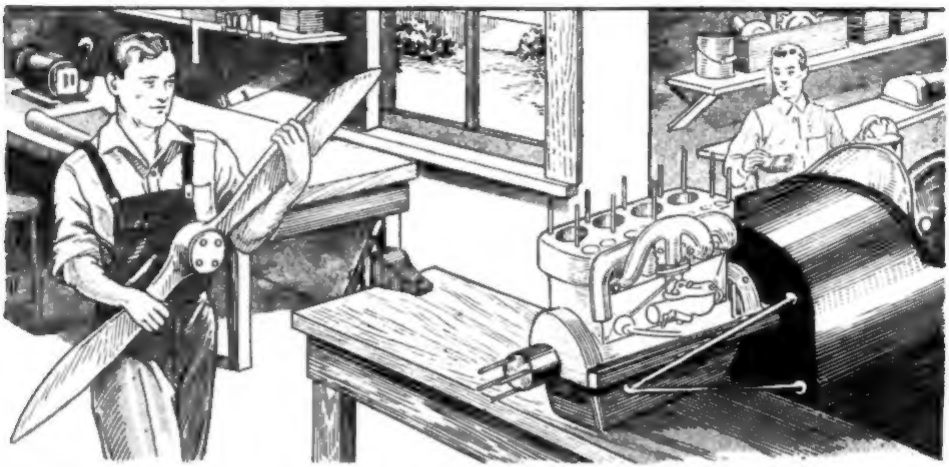

WITH a few simple tools such as hammer, chisel, saw and drills, and perhaps a portable welding outfit, you can fit yourself out with a neat workshop in the garage or barn where you can build that dream plane of yours. You'll find the complete plans, with working drawings and photographs, of America's most popular light planes and gliders in the 1931 edition of the

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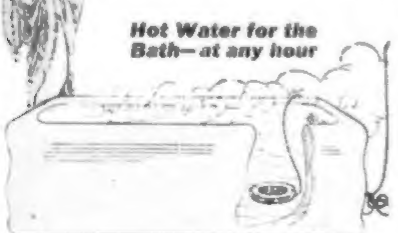

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